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THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES

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THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES

NOVEMBER, 1911

ORIGINAL ARTICLES

TRICUSPID STENOSIS, WITH A REPORT OF FIVE CASES.[1]

By Thomas B. Futcher, M.B.,

Associate Professor of Medicine, Johns Hopkins University, Baltimore.

A search of the literature reveals two facts concerning tricuspid stenosis. First, the lesion is comparatively rare; and second, very few cases are recognized during life. Up to 1908, 187 cases had been reported, and in only 12 has a correct *intra vitam* diagnosis been made. Of 26,000 medical admissions to the Johns Hopkins Hospital, there have only been 8 cases in which there was either a clinical or postmortem diagnosis of tricuspid stenosis. In only 5 cases has the lesion been found post mortem out of a total of 3500 autopsies. In only 1 of these 5 cases (Case I) was a correct diagnosis made during life. Including the cases here reported, there have been only 13 out of a total of 195 cases in the literature in which the lesion was recognized.

Case I (Med. No. 24,057).—*Diagnosis of combined tricuspid, mitral and aortic stenosis made during life; confirmed at autopsy. The generalized narrowing of the whole aorta would suggest the possibility of a congenital element in the production of the stenosis. The tricuspid orifice was almost obliterated, the measurements of the slit being 1 cm. in length and 4 mm. in width. No rheumatic history.*

A. J., female, married, aged thirty-seven years, was admitted to the private ward of the Johns Hopkins Hospital, April 30, 1909, complaining of shortness of breath and dropsy. The writer had

[1] Read before the Association of American Physicians, May 10, 1911.

seen the patient the day previously with Dr. H. Warren Buckler, at Dr. Kelly's Sanitarium, where she had been sent for suspected pelvic trouble. As no gynecological disease was found, and since it was perfectly obvious that there was serious organic heart trouble, she was transferred to the Johns Hopkins Hospital.

The family history was unimportant. She had not been a "blue baby." Her husband stated that she had possessed a "high color" even before they were married seventeen years ago. She had never had any inflammatory rheumatism or arthralgia. There had been recurring sore throats. At the age of nineteen she was seriously ill for several weeks with severe abdominal pain and constipation. Neither she nor her husband knew the true nature of this trouble.

The symptoms for which she was admitted had begun nineteen years before with shortness of breath. After an attack of influenza, twelve years ago, she became worse. The dyspnea, palpitation of the heart, and cyanosis had been present since then, and the cyanosis had been especially marked for five years. In 1904 she had an attack of broken compensation, with edema of the feet, and it was then recognized by the family physician that she had heart disease. Since that date there have been two attacks of decompensation, the last one beginning eight weeks ago. Orthopnea first manifested itself during this attack. Swelling of the legs and abdomen have been marked. The cyanosis had been extreme recently.

On May 1 the writer dictated a note from which the following abstract is made: The patient was of short stature and rather stout. Very extreme cyanosis of the ears, lips, cheeks, and fingernails. There was a distinct icteroid tint of the face and sclerotics. It was impossible to count the radial pulse, only an occasional beat being perceptible. On auscultation over the heart, there were 79 beats per minute.

The examination of the lungs revealed a large pleuritic exudate on the left side and some dulness at the right base, with numerous medium moist rales on inspiration.

The note on the heart was as follows: "The point of maximum cardiac impulse is just seen and felt in the fifth interspace, 11 cm. from the midsternal line, and just in the midclavicular line. There is very slight precordial bulging, but practically no pulsation or heaving. Systolic shock distinctly tapping at the apex. No definite thrill. The deep cardiac dulness begins at the upper border of the third rib at the left sternal margin, and extends from a point in the fourth right interspace, 5 cm. from the midsternal line and merges in the flatness due to the pleural fluid on the left side, but apparently it extends considerably beyond the mammillary line. There is apparently no Rotch's sign to the right. The absolute cardiac dulness begins at the upper border of the fourth rib at the left sternal margin, and reaches from the right sternal mar-

gin, at the level of the fourth rib, to the point of maximum impulse in the fifth interspace. On auscultation, the first sound is very snapping at the apex. There is, at present, no definite presystolic murmur, but there is a slight echoing, rumbling murmur in diastole. There is no systolic bruit at the apex. The second sound is not audible here. The heart's action is quite irregular. In the fourth and fifth interspaces at the left sternal border the snapping quality of the first sound is even more marked than at the apex, and the tapping systolic shock is very striking here. The second sound is here audible and is definitely reduplicated. There is no rumbling presystolic murmur in the tricuspid area. In diastole, there is, however, on very careful auscultation, a very faint, soft, prolonged, blowing diastolic murmur. At the aortic area yesterday there was a faintly palpable systolic thrill. It is just perceptible this morning. The first sound is audible, and is accompanied by a very rough systolic murmur, transmitted upward to the sternoclavicular articulation. The second aortic is quite loud, and, if anything, accentuated. There is no aortic diastolic bruit heard here. Pulmonic sounds clear. Second pulmonic accentuated. The external jugulars are only slightly distended."

The liver flatness extended from the sixth rib to a point apparently on a level with the costal margin in the mammillary line. In the median line it reached only to the tip of the ensiform. Owing to the edematous abdominal walls, it was not possible to satisfactorily palpate for the liver border. There was no visible or palpable liver pulsation. There was thought to be a moderate amount of ascitic exudate.

There was very marked edema of the dependent portions of the trunk, as well as of the hands, arms, thighs, and legs. Over the backs of both wrists, there were quite numerous pin-point and pinhead sized petechiæ.

On the previous day, April 30, Dr. Boggs had heard a mitral systolic murmur at the apex, and a faint aortic diastolic murmur down the left sternal border. Dr. Henry, the house officer, had noted a definite rumbling murmur in diastole at the mitral area, and that the liver border extended half way to the umbilicus. It was also noted that there was no systolic pulsation of the veins of the neck.

During May 1, the patient's condition gradually became worse. The removal of 500 c.c. of straw-colored fluid from the left pleural sac failed to give much relief to the dyspnea. There was a curious sighing dyspnea, the respirations being only twelve to the minute. The heart was even feebler, and the rate had risen to 120 per minute.

On May 3 she was much worse. Only 200 c.c. of urine had been secreted into the bladder since mid-day of May 2. The heart action became even feebler, and more irregular, and the rate had risen to 140 beats per minute. The cardiac murmurs had practically dis-

appeared. The respirations became extraordinarily slow, and the patient died at 3.15 P.M.

Clinical Diagnosis. *Intra vitam*, a diagnosis of mitral stenosis and insufficiency, aortic stenosis and insufficiency, and a probable tricuspid stenosis was made.

Autopsy Report (*No.* 3214). The autopsy was performed by Dr. W. C. MacCullum.

Anatomical Diagnosis. Tricuspid, mitral, and aortic stenosis; dilatation and hypertrophy of the auricles; contraction and atrophy of the ventricles; chronic passive congestion of all tissues except lungs—extremely marked in liver—less so in other organs; generalized edema; pleural and pericardial effusion; compression, atelectasis, and edema of the lungs; hemorrhagic infarction of the lungs; acute diphtheritic, hemorrhagic colitis; generalized narrowing of the arteries and thickening of the veins.

I quote the following from Dr. MacCallum's report: The body is that of a slenderly built white woman, 167 cm. in length. There is marked edema of the legs, genitalia, and to a less extent of the abdomen, hands, and arms. There are petechiæ over the hands and arms, and pigmented areas over the legs. There are marks of needles through which the edematous fluid was drawn. The subcutaneous fat is present in moderate amounts, yellowish red in color. This is true also of the very much congested fat in the omentum and the mesentery. The peritoneal cavity contains no excess of fluid. The serous surfaces are everywhere congested. The liver is very rough and nodular, and extends 8 cm. below the ensiform, and 4 cm. below the costal margin. It is very deep blue in color, and on pressure the blue color disappears and leaves a pale brown liver substance. A considerable quantity of fluid is present in each pleural cavity, perhaps 600 c.c. in the left and not so much in the right pleural cavity. The left lung is markedly compressed and bound by a few adhesions at its anterior part. Compression of the right lung is not so marked.

The *pericardium* is distended with clear straw-colored fluid (400 c.c.). There are distinct remnants of thymus tissues. The heart is not especially enlarged throughout. The right auricle is enomously distended, however, and from the insertion of the inferior cava to that of the superior cava measures about 7 cm. Its surface shows a number of tendinous patches. It is very irregular, distorted, and retracted here and there. The fat about the right ventricle is congested. The left ventricle is firmly contracted. The veins and arteries are prominent over its surface. It is deep blue in color. The left auricle is small and apparently nearly empty. The dilatation, therefore, is especially on the right side of the heart and particularly in the right auricle.

Heart. Weight, 300 grams. The heart superficially is smooth, except for the presence of the tendinous patches described, which are

found especially over the right side. The right auricle contains only fluid blood, except in the auricular appendage, where there is a globular thrombus about 1.5 cm. in diameter, the surface of which shows the corrugations very distinctly. This projects from the intertrabecular space. It contains some soft, semifluid, brownish, bloody material, and a central portion, which is rather firmer. On opening the right auricle, it is found that the auricular walls are distinctly thickened. This is especially true of the great trabeculæ which run across its walls. Among the trabeculæ at one point in the auricular appendage there is a small globular thrombus which has a corrugated surface, and which is internally softened. It measures about 1.5 cm. in diameter. The tricuspid orifice is almost obliterated. The valves stretch across the ring and form a wrinkled diaphragmatic membrane, which is thicker in some parts than in others. They leave a small orifice about 1 cm. in length, and about 4 mm. in diameter, which is slightly irregular and bordered by a rough, thick margin. This is the only passage for blood into the right ventricle. The coronary sinus is enormously widened. It easily admits the gloved thumb. The right ventricle is diminished in size. Its wall is about 5 mm. in thickness. Its length is only about 5.5 cm. The papillary muscles and the chordæ tendineæ are extremely thickened. The pulmonary orifice measures 6.5 cm. in circumference. Its valves are perfectly delicate and normal in form. The pulmonary artery is smooth and delicate. The endocardium of the left auricle is unusually thickened and opaque. The wall of the left auricle is somewhat thickened, measuring at its maximum 5 mm., on an average about 2 or 3 mm. The mitral orifice is markedly contracted. The mitral valves are extremely thick, and are grown together so as to form the usual type of diaphragm which one finds in cases of mitral stenosis. The orifice itself is crescentic, measuring about 2.5 cm. in transverse diameter and only about 4 mm. across. At one end it has the appearance of being split or torn and is covered with a slight roughening, which looks somewhat like a minute thrombus mass. There are no thrombi in the left auricle. The left ventricle is small. It measures about 7 cm. in length at its maximum, and averages about 14 mm. in thickness. It is apparently not at all hypertrophied. The conus arteriosus of the aorta is somewhat constricted by the growth of fibrous tissue. The valvular orifice is very small, measuring only about 1 cm. in length, and 5 or 6 mm. in breadth. The aortic valves are enormously thickened and grown together, so that the circumference of the valvular orifice is only 3.5 cm. The sinuses of Valsalva are largely hollowed out. The valves at their junctures are grown together throughout more than one-half of their length, and in this way, there is a thick, triangular mass formed at the junction of each two valves. The sinuses of Valsalva are not very completely separated from one another on account of the retraction of the

intervening projection. On the ventricular side of this valvular ring, there is at one point, a cavity in one of these triangular masses, in which the tissue has become blackened and discolored. This blackening shines through a superficial layer of white tissue, but at one point there has occurred a break into the substance of this mass, and a soft, brownish material has poured out through the orifice. The orifice is about 6 mm. in length and 2 mm. in breadth. The aorta just at the valves measures about 5 cm. in circumference. It widens a little above the valve, where it measures about 6 cm. in circumference. Its surface is fairly smooth, but there are a few small sclerotic plaques. The coronary orifices come off a little above the aortic valves. The coronaries are distinctly sclerotic, but there is no actual occlusion. The *aorta* is somewhat narrowed, and measures only about 3.5 cm. in circumference. In the lower portion just above the bifurcation, it measures only 2.5 cm. in circumference. It is especially sclerotic in its lower portion, but there is some sclerosis throughout. The inferior vena cava is, on the contrary, rather wide, and its wall is distinctly thickened, so as to become opaque and white. The carotids and other arteries coming off from the arch appear distinctly smaller than normal.

Liver. Measures 19.5 by 16 by 6 cm.; weight, 1100 grams. Its surface is extremely irregular. After an amount of blood has run away, it is much bile stained. There are large projecting nodules upon the upper surface. Particularly the left lobe shows a very nodular appearance. The inferior cava, as it passes through the liver, is especially thickened and roughened. The gall-bladder contains very thick, dark bile. The lower surface of the liver is also extremely irregular in form. On section, the liver presents an extraordinary appearance. There is absolutely none of the original lobulation to be made out, but there has evidently been great destruction of the lobules in portions of the liver, remnants of which are left; while in other areas there are large radiating lobules which are enormously larger than the original ones. The whole liver has a greenish, bile-stained appearance, and is remarkably variegated by the alternation of these large succulent areas which have a pale, grayish-green color, and a smaller scarred or hemorrhagic area. In some parts, especially the upper part of the right lobe, there are areas almost entirely composed of fibrous tissue, in which the liver substance seems to have been very largely destroyed.

In this case, the diagnosis of mitral stenosis and insufficiency, and of aortic stenosis and insufficiency, were made from some of the usual physical signs of these lesions which were present. We did not feel, however, that these lesions were sufficient to account for all the patient's symptoms. Our reasons for concluding that there was an associated tricuspid stenosis were as follows: (1) The extreme cyanosis. (2) The considerable increase in the cardiac dulness to the right of the sternum. (3) In spite of the fact that

there was an exaggerated systolic shock and a snapping first sound at the apex, both these physical signs were even more striking in the fourth and fifth interspaces at the left sternal margin. The absence of any presystolic thrill or rumbling murmur at the tricuspid area was probably due to the final weakening of the contractions of the left auricle which had become so enormously dilated. This case demonstrated the value of the exaggerated systolic shock and the snapping quality of the first sound at the tricuspid area in aiding in the diagnosis of tricuspid stenosis, just as they are of great importance in the diagnosis of mitral stenosis. In the latter lesion they are often present without either the presystolic thrill or murmur. The tricuspid narrowing in this case was extreme, the measurements of the opening being 1 cm. in length by 4 mm. in width. Whereas, the narrowing of all three orifices was probably endocarditic in origin, yet the possibility of a congenital origin must be seriously considered. This was suggested by the marked hypoplasia of the aorta.

The remaining 4 cases will be reported very briefly, although some of them developed remarkable complications which might be dwelt upon.

CASE II (Med. No. 9423).—E. O'H, female, white, single, aged thirty-five years, was admitted to the hospital January 4, 1899. She remained continuously in the hospital until her death on October 22, 1902. She had chorea at eleven, and there had been eight attacks of acute articular rheumatism before admission. She had been dyspneic and slightly cyanotic for years. She had characteristic signs of mitral stenosis, but at no time was a tricuspid stenosis or aortic lesion suspected. During her observation in the hospital, she had an embolism of the left popliteal artery, as well as a thrombosis of the left external jugular and subclavian veins. Death was preceded by the sudden development of symptoms and signs of thrombosis of the aorta with complete loss of power of both lower extremities and anesthesia to the waist-line.

Autopsy No. 2015 (Dr. MacCallum). *Anatomical Diagnosis.* Chronic endocarditis; stenosis and insufficiency of the tricuspid and mitral valves; contraction of the aortic valves; occlusion of the left jugular and subclavian veins with subsequent canalization; thrombosis of the aorta and both common iliacs; infarction of the spleen and kidneys; chronic passive congestion of the viscera; obesity.

The right auricle was tremendously enlarged, and the tricuspid orifice was represented by a slit measuring 2 by 1 cm.

CASE III (Med. No. 14,415).—I. K., female, white, married, aged thirty-five years, was admitted to the hospital May 28, 1902, complaining of dropsy. She had never had chorea, rheumatism, nor recurring tonsillitis. The cardiac symptoms began seven years before admission, with dyspnea and edema of the legs, during the latter

months of a pregnancy. These symptoms had continued up to the time of admission.

The patient was markedly cyanotic and dyspneic. The pulse was of very small volume and irregular in force and rhythm. The heart was much enlarged to the left, but there was no enlargement to the right, as made out by percussion. There were characteristic auscultatory signs of mitral stenosis and insufficiency and of tricuspid and aortic insufficiency. There was nothing in the records to indicate that either tricuspid or aortic stenosis were suspected.

Autopsy No. 1937 (Dr. MacCallum). *Anatomical Diagnosis.* Chronic endocarditis; aortic, mitral, and tricuspid stenosis and insufficiency. Chronic passive congestion of the viscera. Hemorrhagic infarction of the right lung. Serofibrinous pleurisy with compression of the lung. Chronic endometritis.

The tricuspid orifice was not narrowed to the same degree in this case as in the previous two cases. It admitted only two fingers however.

CASE IV (Med. No. 14,525).—A. B., female, white, single, aged thirty-six, was admitted to the hospital, June 27, 1902, and died the following day. She had an attack of rheumatism as a child and said she had suffered from heart trouble ever since she was a schoolgirl.

The patient was desperately ill on admission. There was extreme cyanosis and marked dyspnea. The heart was in delerium cordis, and very little could be made out. There was a presystolic thrill at the apex, together with a systolic and presystolic murmur. Apparently no suspicion of a tricuspid stenosis was entertained.

Autopsy No. 1957 (Dr. Opie). *Anatomical Diagnosis.* Chronic endocarditis of mitral valve with stenosis. Chronic endocarditis of tricuspid valve with fusion of segments and stenosis. Dilatation and hypertrophy of the right side of the heart. Chronic passive congestion of lungs, liver, spleen, and gastro-intestinal tract. Myoma of uterus.

The right auricle was greatly distended and formed about one-third of the anterior surface of the heart. There was a marked degree of narrowing of the tricuspid orifice, two of the segments being completely welded together.

CASE V (Med. No. 17,934).—M. W., female, white, married, aged twenty-nine years, was admitted to the hospital December 27, 1904. Death occurred the following day. When twenty years of age a physician had told her that she had heart disease. There was a history of rheumatism. She had never had dyspnea or edema before May, 1904.

There was extreme cyanosis and marked increase in the cardiac dulness toward the right. There were auscultatory signs of mitral stenosis and insufficiency, aortic insufficiency, and tricuspid insuffi-

ciency. There apparently was no suspicion of the existence of tricuspid stenosis.

Autopsy No. 2449 (Dr. Bunting.). *Anatomical Diagnosis.* Chronic endocarditis of the tricuspid, mitral, and aortic valves, with stenosis of the tricuspid and mitral orifices; hypertrophy and dilatation of the heart; thrombosis of the right auricular appendage, with a free thrombus in the left auricle; general chronic passive congestion of the viscera; red atrophy of the liver; general edema with ascites; infarction of the kidneys.

The contraction of the tricuspid orifice was moderate. It admitted the tips of two fingers. The statement regarding the aortic orifice was as follows: "The segments of the aortic orifice are thickened and curled and apparently would present a slight interference to the outflow of blood, although the orifice admits the tip of the index finger."

We may briefly summarize these 5 cases as follows: All were females. Their respective ages were thirty-seven, thirty-five, thirty-five, thirty-six, and twenty-nine years. There was a definite history of rheumatism in 3, one of these also having chorea. The etiological factors were not clear in the other two. It is possible that there may have been a congenital element in Case I. In all 5, there was a marked mitral stenosis lesion. In 3 of the 5 there was a definite aortic stenosis. In the fourth there was thought to be some aortic narrowing. In the fifth case the aortic valves were normal. In all 5 the pulmonic valves were unaffected.

Duroziez,[2] in 1868, Leudet,[3] in 1888, J. B. Herrick,[4] in 1897, and W. W. Herrick,[5] in 1908, have anayzed the cases appearing in the literature, the latter tabulating 187 cases, which apparently do not include the case which he himself reports, and in which a positive diagnosis was made. Since then I have been able to find but 2 cases reported, that of Barie and Cleret,[6] in which they made a diagnosis of Stokes-Adams disease with combined mitral and aortic stenosis and insufficiency, the tricuspid stenosis being discovered at autopsy, and that of Mackenzie,[7] in which a correct clinical diagnosis was made.

Adding to the 187 cases reported by W. W Herrick, his own case, those of Barie and Cleret, and of Mackenzie, and the 5 here reported, we have a total of 195 cases. These may be analyzed as follows:

[2] Gaz. des hôp., 1868, xli, 310.
[3] Thèse de Paris, 1888.
[4] Boston Med. and Surg. Jour., 1897, cxxxvi, 244.
[5] Archives of Internal Medicine, 1908, ii, 291.
[6] Arch. d. Mal. du Cœur, Paris, 1910, iii, 209 to 217.
[7] Diseases of the Heart, 1908. p. 304.

SEX.

Male	38
Female	141
Sex not known	16
	195

AGE.

10 to 20 years	16
20 to 30 years	60
30 to 40 years	44
40 to 50 years	29
50 to 60 years	10
60 to 70 years	6
Not known	30
	195

PREVIOUS HISTORY.

Rheumatism	66
Doubtful rheumatism or chorea	11
No rheumatism	35
Not known	83
	195

ASSOCIATION OF VALVE LESIONS.

Tricuspid alone	14
Tricuspid and mitral	104
Tricuspid and aortic	64
Tricuspid, mitral, and aortic	6
Tricuspid, aortic, and pulmonary	1
Tricuspid—endocardium of left auricle	1
Tricuspid, mitral, and pulmonary	12
Cases with adherent pericardium	12

ETIOLOGY. Undoubtedly tricuspid stenosis is often due to endocarditis following rheumatism, or some other acute infection. The fact that it is almost invariably accompanied by lesions of the mitral or aortic valves confirms this view. Osler states that congenital cases are not uncommon. This is supported by the opinion of other observers. These are usually accompanied by some other defect. The absence of any rheumatic history and the existence of a generalized narrowing of the whole aorta would suggest very strongly that the stenosis in Case I may have been congenital in origin. These congenitally defective valves are undoubtedy very liable to postnatal endocarditis.

SYMPTOMS. The conspicuous symptom is the extreme cyanosis in the majority of cases. This is due to the marked venous stasis resulting from the tricuspid narrowing. Occasionally it has been absent, as in Shattuck's[8] case. Otherwise, there is nothing char-

[8] Boston Med. and Surg. Jour., cxxiv, p. 307

acteristic. Dyspnea may be extreme when broken compensation, due to over dilatation of the right auricle, supervenes. It is surprising with what degree of comfort these cases are enabled to go about for years. This is probably due to the fact that the narrowed auriculoventricular orifice lessens the engorgement of the pulmonary circulation and the consequent dyspnea. In the terminal stages of the disease, dyspnea may become extreme, even on the slightest exertion. Cough, general anasarca, and effusion into the serous sacs also supervene.

PHYSICAL SIGNS. I. *Inspection.* (1) A presystolic pulsation may be observed in the jugular veins and in the markedly enlarged liver if the case is seen when the right auricle is still compensating. With the striking tricuspid narrowing so often seen, the right auricle is not able to readily empty itself, and there is a consequent wave transmitted backward into the nearby venous trunks. This sign disappears in many of the cases with decompensation, as the auricular contraction is too weak to give rise to a reflux wave during auricular systole. (2) Precordial inspection reveals nothing characteristic. (3) Mackenzie considers a presystolic pulsation of the liver an important sign.

II. *Palpation.* (1) The radial pulse is nearly always extremely small in volume, owing to the overengorgement of the venous and impoverishment of the arterial systems Frequently it cannot be counted, and it is irregular in force and rhythm and of low tension. (2) A presystolic thrill may be, but rarely is, felt at the tricuspid area. It is often difficult to differentiate such a thrill from the accompanying thrill of mitral stenosis. (3) The systolic shock may be marked over the tricuspid area and was of value in arriving at a diagnosis in Case I. In this instance the exaggerated systolic tap was present at the mitral area, but was even more marked at the tricuspid.

III. *Percussion.* The distinguishing feature is increase in the area of cardiac dulness toward the right, especially in the region of the right auricle.

IV. *Auscultation.* (1) When a rumbling, presystolic murmur is audible over the lower sternal region and particularly toward the right border, it is of great value in helping to arrive at a diagnosis. Very frequently the murmur is absent owing to the weak action of the right auricle in the stage of decompensation. (2) The first sound may be snapping at the tricuspid area. This sign, together with the exaggerated systolic shock and extreme cyanosis, were the three which chiefly led us to make the diagnosis in Case I. There was no presystolic murmur at the tricuspid area. (3) The second pulmonic sound is usually said to be enfeebled. This is not always the case, however, as it may be accentuated. (4) Mackenzie has pointed out that the right auricle may become so greatly hypertrophied that it sends back a large wave into the jugular vein

with such force that it causes the valves in the jugular and subclavian veins to close with a snap, which he was able to hear over these veins as a clear, sharp sound preceding the first sound.

Regarding the diagnosis, Shattuck says: "Whether a presystolic souffle can be heard or not, tricuspid stenosis can be pretty safely diagnosticated if the patient is a female with rheumatic history, has mitral stenosis, perhaps also, aortic disease, and presents the evidences of prolonged or recurrent venous stasis of greater or less degree."

The fact that, including the cases here reported, the clinical diagnosis has been made in only 13 out of the 195 cases reported, indicates that recognition of the lesion is not easy. It is nearly always complicated by the physical signs of mitral and aortic disease and this helps to obscure the picture. Another factor must be taken into consideration, and that is, that many of the hospital cases are admitted in a moribund condition. This occurred in two instances in the present series and prevented careful study.

THE OPERABILITY OF INTRAMEDULLARY TUMORS OF THE SPINAL CORD.

A REPORT OF TWO OPERATIONS, WITH REMARKS UPON THE EXTRUSION OF INTRASPINAL TUMORS.[1]

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A study of the literature on intramedullary tumors of the spinal cord will show that almost all authors consider growths within the substance of the cord as inoperable. A few writers (Rothman, etc.) have suggested that such tumors might be operated upon, but Oppenheim, Bruns, and others only mention this possibility.

Intramedullary tumors are not by any means as rare as ordinarily they are believed to be. Thus Allen Starr,[2] quoting from Schlesinger, states that among 302 tumors of the cord, 125 were within the cord substance. These included sarcoma, tubercular tumors, gumma, glioma, lipoma, cysticercus, neuroma, cholestea-

[1] Read at the meeting of the New York Neurological Society, November 1, 1910.

[2] Text-book of Nervous Diseases, 1909, p. 442.

toma, myxoma, teratoma, adenoma (Benda), endothelioma, etc. Many of these intramedullary growths infiltrate the cord substance and increase in size by extending upward and downward, but some enlarge in their transverse diameter, are encapsulated, and of small size. Gowers[3] states that "these tumors in some cases blend with the substance of the cord, but in other instances they are bounded by an area of softening which often isolates even invading growths. Some tumors are sharply limited. The removal of such a tumor could hardly fail to cause a traumatic inflammation that would damage and perhaps destroy all of the elements of the cord at the spot and would probably be permanent in its effects."

If it can be done with little or no injury to the cord, there is no valid reason why such localized growths should not be removed. We believe that some operators have in fact removed tumors from the substance of the cord, which appeared to them extramedullary. Schlesinger[4] declares that the tumors may bulge from the cord to such a degree that on first view they give the impression that they are extramedullary.

During the past year we have twice encountered what we believe to have been an intramedullary growth of the cord,[5] and in each case, by a method to be described, have removed the tumor from its bed in the cord substance.

CASE I.—*Intramedullary gliosarcoma of the cervical cord (fifth, sixth, and seventh segments); laminectomy and removal of the tumor in two stages; recovery.* Dr. B. L., aged forty-two years, was referred to the surgical department for operation from the service of Dr. J. Fraenkel on January 12, 1909, with the following history: After a sore throat in the spring of 1907, the patient began to suffer with pain in the back of the neck, of a boring character. The pain gradually spread over the shoulders and down the arms, and was followed by numbness in the right hand. For about two years these symptoms occurred in attacks, and between the attacks the patient felt well. In the summer of 1909 she first began to notice some awkwardness in the left arm, soon followed by considerable loss of power in the left arm, and later in the left leg. About this time the pains in the upper extremities grew less marked. By the fall of 1909 the awkwardness had affected also the right upper and lower extremities, and the patient's loss of power was so great that she had much difficulty in walking. Then followed a rapid loss of power in the upper extremities, especially the left, and a recurrence of the pain in the back of the neck and shoulders. Soon the lower limbs became weak and stiff.

[3] Diseases of the Nervous System, 1899, p. 609.

[4] Handbuch der Path. Anatomie des Nervensystems, 1904, p. 1109 et seq.

[5] The first patient came from the service of Dr. Fraenkel, and the second from the service of Dr. Collins. We are indebted to these gentlemen for permission to use the histories and medical records.

General condition good; well nourished. Special senses normal; no difficulty in swallowing or in urination and defecation.

Pupils are of normal size, and react well to light and accommodation.

She has to be supported when she sits up in bed; she can walk only with the greatest difficulty when supported. The cervical and dorsal vertebral column are held rigid. There is marked tenderness on percussion over the spines of the fourth, fifth, and sixth cervical vertebræ. When the attempt is made to flex the neck on the chest, the patient has a feeling of constriction around the upper part of the chest.

The motor power in both upper extremities is much diminished, but much more on the left than on the right side. When the patient attempts to move either extremity there is coarse ataxia, and she says she does not know the position of the limbs unless she looks at them. The left arm can hardly be raised away from the body; all movements at the elbow are weak; extension of the forearm is impossible. All of the muscles of the left arm and forearm react only slightly to the faradic current; no contraction of the triceps can be obtained.

There is marked atrophy of the muscles forming the thenar and hypothenar eminences on the left side, of the triceps and the infraspinatus.

On the right side there are the same changes as on the left, but very much less marked.

The motor power in the lower extremities is much diminished, especially on the left side. The knee-jerks are exaggerated, especially on the left side; double ankle clonus, Babinski, Oppenheim, left greater than right.

The sensory changes are represented in Fig. 1.

X-ray examination failed to show any changes in the vertebral column. The fluid obtained by lumbar puncture was not under great pressure, and did not contain anything abnormal.

Surgical History. January 13, 1910, laminectomy, first stage (Dr. Elsberg). Median incision over spinous processes of fourth cervical to first dorsal vertebræ; exposure and removal of spines and laminæ in usual manner; little bleeding, well controlled by packings of hot saline solution. Dura tense; no pulsation can be seen or felt. Incision in dura, 5 cm. long; escape of moderate amount of cerebrospinal fluid from above; exposed portion of cord much enlarged; no evidence of tumor on any side of cord.

In incising the dura, the smooth posterior surface of the prominent and enlarged cord was nicked in two minute spots. From the small accidental openings distinct tumor tissue began to extrude from the otherwise intact cord. The minute openings were then united by an incision in the posterior surface of the cord, and the intramedullary growth became more and more prominent. It was evidently

advisable to further enlarge the incision in the cord and allow the natural intramedullary pressure to gradually extrude the growth. The incision in the posterior column was then enlarged until it was 1 cm. long. Under the eye there then occurred extrusion of a small mass which was clearly tumor tissue, and which seemed to be connected with a larger mass within the substance of the cord.

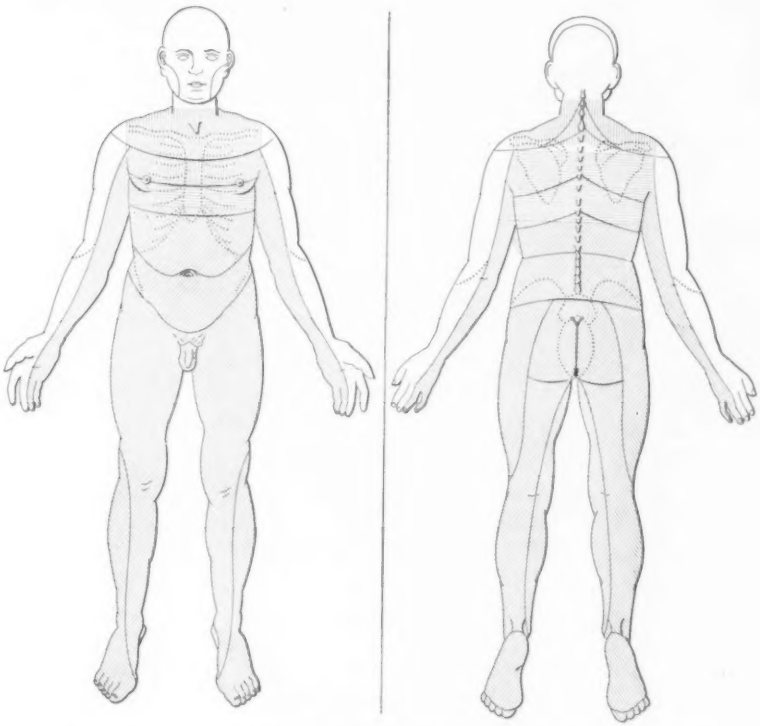

FIG. 1.—Case I. Verticals, hyperalgesia; horizontals, anesthesia; oblique lines, hypesthesia and hypalgesia.

The operation had thus far lasted only forty minutes, and little blood had been lost. The patient's condition was, however, not very good; she looked pale, and her pulse was 120, and only of fair quality. I concluded, therefore, to desist from any further manipulations for the time being. The muscles were carefully sutured, together with interrupted catgut stitches, the fascia with a continuous stitch, and the skin edges united by a subcuticular suture. Voluminous dry dressing.

The patient was in good condition on the following day, but the second operation was delayed for one week.

January 20. Ether anesthesia; dressings removed; wound had healed by primary union; wound reopened and dura and cord exposed (Dr. Elsberg).

A large tumor mass had been extruded from the cord and lay almost outside of and on top of the cord between the fourth cervical and first dorsal segments. With little difficulty, very slight handling of cord substance, and practically no bleeding, the tumor was peeled out of its bed. Three posterior nerve roots on the left side ended in a thin layer of cord tissues, which formed part of the wall of the cavity left after removal of the tumor.

FIG. 2.—Intramedullary tumor of cervical cord removed from Dr. L. in two stages.

After careful cleansing of the cavity the edges of the pia were sutured together with fine catgut; the dura closed by a running suture of fine silk, and the muscles and skin united by catgut sutures. Dry dressing. Duration of operation, fifty-five minutes; condition of patient at end of operation good; pulse 108, and of good quality; respirations regular and deep.

The tumor that had been removed was of a reddish-brown color; soft and edematous; it measured 5.3 by 2 cm., weighed 15 grams. The specimen (Fig. 2) was examined by Dr. F. S. Mandlebaum, director of the laboratory of the Mt. Sinai Hospital, who reported it to be a gliosarcoma.

The patient made a rapid recovery from the operation. The wound healed by primary union, and all dressings were discarded after the second week.

For the first few days after the operation the weakness in the extremities and the sensory disturbances were somewhat more marked. Rapid improvement followed. By the end of the fourth week the

patient was able to sit up out of bed, without assistance. The muscular power in the limbs improved rapidly; by the time she sat up out of bed, she had regained practically all of her power in the right and very much power in the left upper limb. The paralysis of the triceps had disappeared. The muscular power in the lower extremities returned somewhat more slowly, but there was a constant and steady improvement.

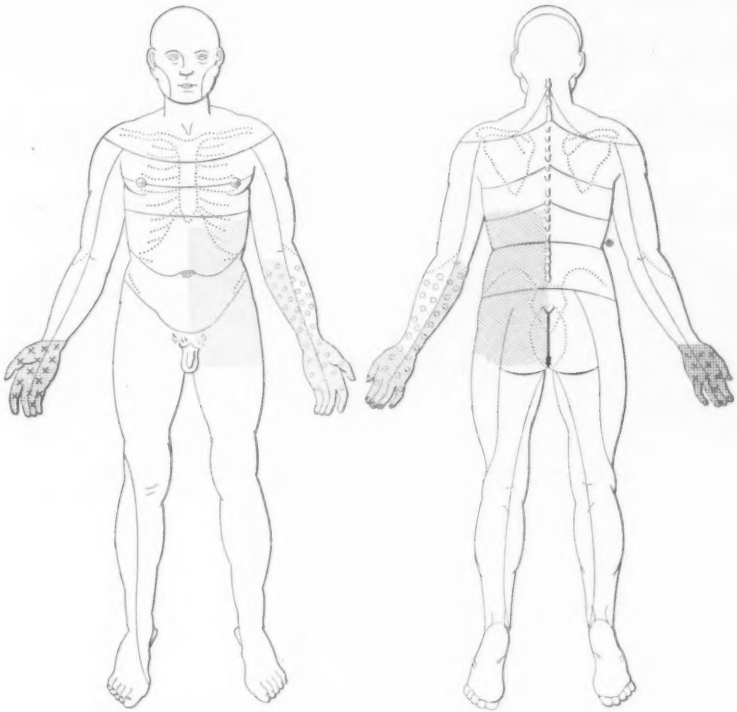

FIG. 3.—Case I. Sensory disturbances eight weeks after the removal of the tumor; areas shaded similar to those in Fig. 1. Crosses, hyperalgesia to hot and cold; circles, analgesia to heat and cold.

By the beginning of March (two months after the operation) she was able to stand on her feet and take a few steps when well supported; but her lower limbs, especially the left, were still very ataxic. Most of her sensory disturbances had by this time disappeared (Fig. 3).

At the present time, eight months after the operation, she can write and use the typewriter, and can walk considerable distances

without support. She still has some hyperesthesia in the left hand, and her lower limbs, especially the left, are still somewhat stiff. She is steadily improving. This improvement has been much aided by thorough massage and exercises, which have been given her by Dr. Wolf of this city.

REMARKS. This case is of unusual interest. The patient was transferred to the surgical department by Dr. Fraenkel, with the diagnosis of tumor of the cord between the fourth and seventh cervical segments.

At the second operation we were not absolutely certain that the tumor was a true intramedullary one, and considered that possibly, in spite of the fact that underneath the pia part of the lining wall of the tumor was formed by tissue containing the superficial origin of several nerve roots, and that we had incised the cord substance in order to allow the tumor to extrude, the tumor had simply been one underneath the pia which had grown into the cord in such a way that the cord bulged around the tumor. A more careful study combined with the experience that we had in a similar case which came to autopsy, and in which a careful examination of the cavity of the cord was made for us, has convinced us that both were cases of intramedullary growths of the cord. At the first operation the small accidental incisions into the cord and the subsequent more liberal incision on the posterior aspect of the cord proper exposed the intramedullary tumor. At the second operation the large extruded growth had been squeezed out of its intramedullary bed, and could be lifted up and peeled off with ease, leaving the wall of the cavity in the cord. On the left side, three posterior nerve roots could be seen running into the thin shell of the cord, which at this point had enveloped the neoplasm.

CASE II.—*Intramedullary tumor (glioma) of the cervical cord (fourth to sixth segments); laminectomy and removal; death in four hours from respiratory paralysis.* Sarah B., aged forty years, was referred to the surgical department with the diagnosis of tumor of the cervical cord, from the service of Dr. Joseph Collins, on February 18, 1910.

About two years before, the patient began to have pain in both upper extremities, and at the same time noticed that her arms were becoming weak. The left arm was affected more than the right, but the symptoms began at the same time in both limbs. The limbs gradually became weaker, and about one year later she began to have attacks of pain in her abdomen.

For the last six months the patient has been unable to walk or to use her lower limbs, and for two months she has not had control of her urine.

The patient was in poor condition when admitted into the service of Dr. Collins, so that it was impossible to obtain much history from her. She frequently contradicted herself.

She was much emaciated; her pulse was very weak; she was constantly wet from incontinence of urine.

Marked tenderness to percussion over the third, fourth, and fifth cervical spines. Decided atrophy of interossei on both sides of upper extremities; marked flattening of thenar and hypothenar eminences. Arms do not seem atrophied. Flexion of forearms on arms is good; extension is decidedly weak; there is only a weak contraction of the triceps muscle; all movements of arms and forearms are weak; reflexes at elbows and wrist-jerks cannot be obtained.

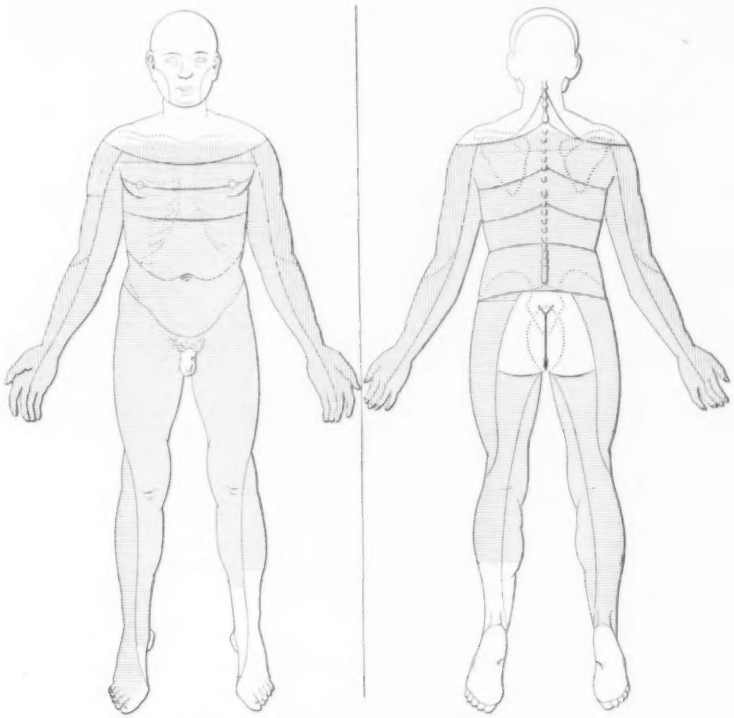

FIG. 4.—Case II. Sensory disturbances before the operation. Shading similar to that in Fig. 1.

There is complete paraplegia, with increased knee-jerks, ankle clonus, Babinski, Oppenheim, and Mendel-Bechterew.

For sensory changes see Fig. 4.

There is marked tenderness to pressure over the spinous processes of the third, fourth, and fifth cervical vertebræ, especially over the fourth.

February 19. Patient has been rapidly growing weaker. She

is frequently cyanosed, and has difficulty in breathing. At times her pulse is almost imperceptible.

February 19. Laminectomy (Dr. Elsberg). Removal of fourth, fifth, sixth, and seventh cervical and first dorsal spines and laminæ in the usual manner. In the upper part of the exposed dura the pulsation was marked; below no pulsation could be observed. Incision of the dura for 5 cm.; cord appears much distended between fourth and sixth segments; palpation of cord substance reveals in this region a marked tumefaction of this part of the cord. Above the affected area the cord looks soft and pulsates markedly, while the part of the cord in which the tumor lies does not pulsate. A small incision was now made in the pia over the most prominent part of the cord in the median line; at once a part of a tumor mass bulged through the cord tissue. The incision was then lengthened

FIG. 5.—Intramedullary tumor of cervical cord removed from the patient, Mrs. B.

and deepened, when the tumor at once began to bulge out of the cord substance. The intramedullary pressure seemed so great that in a few minutes the larger part of the growth was extruded. As it was well encapsulated, it was lifted out of its bed with ease, and with practically no bleeding. After the wound in the cord had been thoroughly irrigated with saline solution, the cavity in the cord with the overlying pia was closed by interrupted sutures of fine silk, and the dura and soft tissues closed in the usual manner.

The tumor (Fig. 5) measured 4½ by 2 cm.; it was of a yellow color, and fairly hard. The microscopic examination revealed it to be a cystic glioma.

The entire operation had lasted less than forty minutes. At the conclusion, the patient looked slightly cyanosed, although the respirations were regular and deep. The pulse was weak, and varied between 112 and 120. The character of the pulse was no worse than it had been at the beginning, and the patient did not look at all shocked. Three-quarters of an hour later she was fully awake, and asked for water; she was still slightly cyanosed, and her breath-

ing had a jerky character. Two and one-half hours later she suddenly became pale, her pupils widely dilated, and no pulse could be felt at the wrist. A few minutes later the breathing stopped. In spite of active stimulation, artificial respiration, intratracheal insufflation of oxygen, her heart action became rapidly poorer until death occurred.

At the postmortem examination the wound was found in perfect condition; there were no clots in the cavity in the cord (Fig. 6).[6]

REMARKS. This patient grew worse so rapidly that operative interference, if done at all, had to be done without delay. The removal of the tumor, after its exposure, occupied two or three

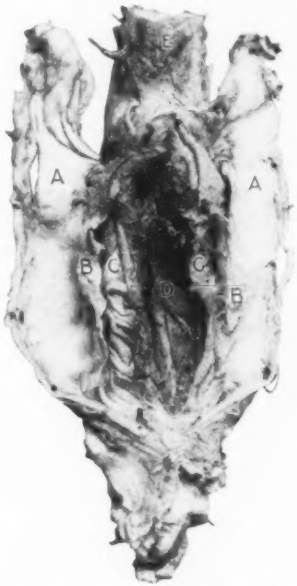

FIG. 6.—Part of cervical cord of Mrs. B.: *A*, dura; *B*, pia; *C*, cord tissue with origins of posterior nerve roots; *D*, cavity in substance of cord left after removal of tumor; *E*, cord.

[6] We are indebted to Dr. I. Strauss, of the Cornell University Medical School, for the examination and following report on the tumor and cord:

"The tumor is a very cellular glioma. The piece of growth examined has a thin capsule, which contains bloodvessels and stains red with Van Gieson stain.

"The section of the spinal cord shows an absence of the posterior columns, which is due to the presence of the growth in this region. The posterior horns of the gray matter are present, and the posterior roots and their entrance zones are preserved. The bases of both posterior horns are abnormally vascular, probably because of the attachment of the tumor. The anterior wall of the central canal can be recognised from the presence of a few epithelial cells, which lie dorsally to what remains of the anterior commissure. The posterior wall has been destroyed by the growth or through its removal. The anterior horns and their ganglion cells are fairly well preserved. The anterior spinal vessels, both artery and vein, are unusually large and tortuous, and suggest that they may have been concerned in furnishing the blood supply to the tumor."

minutes, and we therefore felt that it was justifiable to do the entire operation in one stage. The dura was fully exposed within ten minutes after the incision of the skin, and the tumor was out within twenty-two minutes of the first incision.

It is very possible, however, that the unfortunate outcome might have been prevented if the operation had been done in two stages. The extrusion of the tumor occurred under the eye, and it would have been better to have allowed the cord structures to have accommodated themselves to their new relations before the actual removal of the tumor.

The above two operations for intramedullary tumors of the cord demonstrate that localized growths of the cord substance must not be considered as inoperable. They should be attacked by the neurological surgeon as readily as subcortical tumors of the brain. The results should be at least as good as those obtained in subcortical intracranial growths. A small incision in the lumbar cord near the posterior median fissure will injure only sensory fibers from the posterior roots of some sacral nerve fibers which regularly degenerate upward when the lower lumbar and sacral posterior nerve roots are divided. These sacral fibers at first occupy a position near the posterior median fissure of the cord, and in their upward course gradually come to lie nearer and nearer to the posterior surface of the posterior median column. The lumbar, dorsal, and cervical ascending fibers lie in order farther and farther forward, and are not apt to be injured when a superficial incision in the posterior column near the median line is made. The main bundles of descending fibers in the posterior columns lie in situations where they are not apt to be injured.

From the above description of the course of fibers as given by Van Gehuchten, it follows that a small incision in the posterior median column will injure or divide fine ascending fibers which are derived from the posterior root fibers of the sacral, lumbar, and perhaps lower thoracic nerves. After having travelled a short distance in the posterolateral white column (column of Burdach), they run up the posteromedian column (column of Goll) into the medulla oblongata.

Based on the anatomical grounds above stated, the writers suggest the following method of treatment for intramedullary tumors of the cord. If after laminectomy and incision of the dura the surgeon finds that he has to deal with a localized intramedullary growth, he should make a small incision, about 1 cm. long, in the posterior median column a few millimeters outside of the posterior median fissure, at the spot where the growth seems to be nearest the surface of the cord. The incision should be deep enough to cut the pia and the substance of the column down to the tumor. The tumor will then begin to bulge through the incision. No matter how markedly the tumor will seem to bulge, the surgeon must not

attempt to remove the growth, for he will be sure to cause grave injury to the cord. He must leave it to nature to extrude the tumor. As the normal intramedullary pressure will tend to readjust itself, the growth, which has caused an increased pressure, will be gradually pushed out of its bed. Nature will do this by a slow and gradual process, and the tumor will be slowly extruded, with a minimum of injury of nerve fibers. Therefore, after the small incision into the cord has been made, the muscles and skin must be closed and the actual removal of the growth left to a second operation.[7] After about one week the wound is reopened and the tumor, which will in all probability be found outside of the cord, can be removed by dividing the few adhesions which remain. If the manipulations are done with delicacy and care, no injury should be done to the cord substance. When the tumor has been removed, the pia should be closed by fine silk sutures, and the dura, muscles, and skin sutured in the usual manner.

In the case of intramedullary tumors which extend over a large number of segments, and which infiltrate the cord substance, a small incision into the cord made in the manner above described at the level of the most marked symptoms, may allow of the partial extrusion of the tumor, with perhaps amelioration of the symptoms.

It is not at all beyond the range of possibility that some cases of spinal gliosis, syringomyelia, and hematomyelia will come into the domain of the surgeon. It is perfectly feasible to drain a central cavity in the cord into the subdural space, and perhaps prevent the symptoms due to pressure of the fluid upon the nerve fibers. In the same way it may be possible to benefit certain cases of hematomyelia by allowing the blood clot to be extruded from the substance of the cord.[8]

The method of treatment above described we have called the "extrusion of intramedullary tumors." We believe that the application of the principle of extrusion to the surgery of intramedullary growths of the cord will open up a new field to neurological surgery. The cases which are reported in this paper are presented as evidence in favor of this view.[9]

[7] In a recent paper (The Special Field of Neurological Surgery, Five Years Later, Bulletin of the Johns Hopkins Hospital, November, 1910) Cushing gives a short description of a case of glioma in the substance of the cord, in which he made an incision in the posterior column and removed a specimen for examination. The improvement in the patient's symptoms was so marked that, Cushing states, "she has so far recovered as to make us regret that the posterior column was not slit throughout the whole length of the exposed and tense cord." Perhaps the improvement was due to the gradual extrusion of the tumor.

[8] In the case of a recent patient from the service of Dr. Bailey, who was operated upon by Dr. Beer, an extensive intramedullary clot was found in the dorsal cord. The intramedullary clot was treated by the method of extrusion. Much old blood was extruded from the cavity in the cord. The condition was probably one of hemorrhage into a cystic glioma or into a cavity of syringomyelia. The patient has fully recovered from the operation, and there has been considerable improvement, but it is too early to say how great the improvement will be.

[9] In a paper published in October, 1909, Zenner and Kramer made a similar suggestion regarding the possibility of the delivery of brain tumors "by the pressure from behind."

ACUTE PHLEGMONOUS GASTRITIS DUE TO THE STREPTOCOCCUS PYOGENES.

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Acute phlegmonous gastritis is a comparatively uncommon finding on the postmortem table. Schnarrwyler,[1] in 1906, reviewed 83 cases that had been reported up to that time. Robertson,[2] in 1907, reported 2 cases of his own and reviewed the previously reported cases, which numbered 89. More recently Adams[3] has reported a case due to the pneumococcus. The literature upon this subject will be found in the papers referred to above.

The chief cause of acute phlegmonous gastritis is the streptococcus, but there are several cases in which the pneumococcus was found, and a few in which the condition was due to other bacteria.

The case here reported points to the symptom of sudden and severe epigastric pain as the salient clinical feature of the disease, and is of interest from both the pathological and bacteriological points of view.

E. B., male, aged thirty years, was admitted in the service of Dr. Lafleur at the Montreal General Hospital, April 26, 1910, complaining of shortness of breath and swelling of the legs.

Personal History. The patient was born in England, had scarlet fever and measles in childhood, gonorrhea at fifteen and a severe attack of typhoid fever in 1905. He was in the habit of taking one or two glasses of beer or whiskey each day, and smoked to excess, six to seven pounds of tobacco a month.

Family History. His father died aged forty-seven years, from cardiac disease, his mother of Bright's disease, aged twenty-eight years. One sister died of puerperal septicemia; three brothers and one sister are living and well.

Present Illness. February 23, 1910, after a hard day's work, he began to have dyspnea and severe pain in the right side and epigastric region. He was subsequently unable to work on account of the dyspnea. His appetite was poor and there were frequent attacks of vomiting. The pain in the right side and epigastrium were constant. On April 23 swelling of the legs was noted and the dyspnea became urgent (orthopnea). On admission the pulse was 136, irregular, of small volume and low tension; the respirations were rapid. The heart was enlarged, the sounds irregular, and there

[1] Archiv f. Verdauungskrank., 1906, xii, 116.
[2] Jour. Amer. Med. Assoc., December 28, 1907, xlix, 2143
[3] Lancet, January 29, 1910, clxxviii, 292.

was an apical systolic murmur transmitted to the left axilla. There was edema of the legs and thighs, tenderness over the epigastrium, and slight muscular resistance over the upper part of the abdomen. The tongue was coated. As soon as food was taken vomiting occurred. The liver was palpable.

He was discharged May 14, 1910, improved.

On June 9, 1910, the patient was readmitted. Soon after he left the hospital the general signs and symptoms which were present on his first admission recurred. The physical examination at this time showed an increase in the cardiac dulness and marked irregularity of the heart rhythm. There was evidence of fluid in the right pleural cavity. The tongue was coated and the breath foul. The abdomen was prominent, but there was no abdominal tenderness or rigidity. There was no dulness in the flanks. The liver was still palpable. The spleen was not enlarged.

The patient did not improve, although the edema disappeared. There was dyspnea, pain in the epigastrium, and over the precordium. Severe hiccough, with vomiting, developed and persisted.

On June 16, 1910, an area of erysipelas appeared on his nose and soon spread over both cheeks. The temperature was elevated and the precordial pain and dyspnea became more marked. The patient soon became delirious, restless, and very noisy. The tenderness over the epigastrium remained acute. On June 19, 1910, he became much worse, and complained of a sudden acute pain in the epigastrium. The pulse failed, and after severe dyspnea he died.

Autopsy. No. 107, 1910. June 19, 1910. Dr. Baird. E. B., aged thirty years; body length, 170 cm.; hour, 9.30 P.M. Service of Dr. Lafleur.

The body is that of a well-developed and well-nourished white male adult. Rigor mortis is general and well marked. There is lividity of the dependent parts and cyanosis of the face, ears, neck, and tissues beneath the finger nails. The pupils are unequal, the right 9 mm.; left, 6 mm. Slight edema over the shins and ankles. There is a dusky red, fairly sharply outlined area over the bridge of the nose and cheeks, throughout which the tissues are thickened, puckered, and of a leathery consistency.

Peritoneal Cavity. The subcutaneous fat is normal. The abdominal muscles are firm, dark red, and well developed. The peritoneum is covered with a viscid exudate, and its bloodvessels are deeply injected. In the pelvis and recesses of the peritoneum there are over 300 c.c. of thick, yellowish fluid, smears from which show Gram positive cocci in short and long chains, There is a yellowish exudate on the under surface of the diaphragm and upper surfaces of the liver and spleen. The stomach is greatly distended, dark bluish red in color; its lower border extending almost to the level of the umbilicus. The intestines are free from obstruction. There are a few small areas of necrosis in the fat about the cardiac

end of the stomach. The subperitoneal and retroperitoneal tissues in the region of the left adrenal gland are edematous. The tissues about the left crus of the diaphragm are thickened and moist. On incision purulent material escapes. The mesenteric lymph nodes are enlarged, pale, and soft. The diaphragm reaches to the fifth rib on the right side and the fifth interspace on the left.

Pleural Cavities. There are no adhesions. The bloodvessels of the right pleura are deeply injected and the pleural cavity on this side contains 350 c.c. of turbid yellow fluid, smears from which shwo Gram positive cocci in short and long chains. The bloodvessels of the left pleura are less injected than those of the right and the cavity itself contains very little turbid fluid. Smears from this fluid also show Gram positive cocci in short and long chains.

The pericardial cavity is enlarged, its wall is of normal thickness. The serosa is smooth, moist, and glistening. There are 120 c.c. of clear yellow fluid present, smears from which show no organisms.

Heart. Weight, 500 grams. It measures 17 by 12.5 cm. in its longest diameters. The epicardium is generally smooth, and its bloodvessels moderately injected. Shining through the epicardium of the left ventricle are two round, elevated, light yellow, edematous areas each about 1 cm. in diameter. Smears from these show Gram positive cocci in short and long chains. The chambers of the heart are widely dilated, particularly the right ventricle, and contain blood-stained serum and postmortem clot. The myocardium is of normal consistence; that of the left ventricle is slightly thickened. The endocardium is normal. The valves are normal, except the posterior aortic cusps, which are sclerosed, much thickened, and show fenestration of their edges. The coronaries are normal. T. V., 15; P. V., 9.5; M. V., 10; A. V., 9; L. V., 2; R. V., 0.7.

Lungs. These organs are voluminous and dark red. On the posterior surface of the right lower lobe there is a round, elevated, firm, very dark red area 2 cm. in diameter. Section of the lobes shows marked congestion, and dark, frothy, blood-stained serum exudes on slight pressure. The dark red area noted above is of a much deeper red, firmer than, and is sharply separated from, the surrounding lung tissue. This area extends from the pleural surface into the lung tissue in an irregular wedge-shape.

Spleen. Weight, 310 grams, dark red. The capsule is covered with a viscid, yellowish exudate. On section the surfaces are dark red, soft, and moist, and pulp comes away freely on scraping. The Malpighian bodies are just visible.

Gastro-intestinal Tract; Stomach. This organ is markedly dilated. The bloodvessels beneath the peritoneal surface are injected. The stomach contains thin, yellowish, turbid liquid. The mucosa is generally a deep red, has a velvety appearance, and is covered with a thin tenacious layer of yellowish mucoid material. Tension shows that the deep red color is not uniform but occurs in small

areas 2 to 4 mm. in diameter, separated by narrow pale bands. There are no ulcers. The wall of the stomach for a distance of 15 to 18 cm. from the esophageal orifice varies in thickness from 4 to 8 mm. On section this thickening is seen to be due to puriform infiltration of the submucosa which exudes drops of thin, yellowish pus, smears from which show leukocytes and chains of Gram positive cocci. The esophagus appears normal. The mucosa and coats of the duodenum, jejunum, and ileum are normal. The intestines contain fecal material; the mucosa in general has a pink cast.

Pancreas. Appears normal.

Liver. Weight, 1930 grams. The surface has a mottled, yellowish-red color, and near the left border of the posterior surface of the left lobe there is a deeply injected area. The edges are sharp. On section the surfaces have a greasy appearance and are of a mottled, yellowish-red color. The mottling is due to light yellow areas, varying from 1 to 4 mm. in diameter, which are separated by deep red intercommunicating bands. The liver tissue is softer than normal.

The gall-bladder is much distended and its walls are thin. Apparently there is no obstruction to the bile passages, for on exposure of the papilla of Vater bile can readily be forced out in a large stream and a probe easily passes into the common and hepatic ducts. On opening the gall-bladder two moderate sized faceted calculi are found.

Kidneys. Weight, 450 grams; enlarged, dark red, and smooth. The capsules strip readily, leaving smooth surfaces. The cortices are pale and of normal width. There is no edema. The pyramids are well defined; the pelves and ureters normal.

Adrenals. The right appears normal; the left is slightly enlarged and very deeply injected.

Bladder and Genital Organs. Normal.

Aorta. There is no sclerosis. The intima is of a deep red color throughout, appearing as if stained with red ink.

Organs of the Neck. Normal.

Brain. Weight, 1425 grams, and is normal.

Middle Ears, Nasal Sinuses, and Bone Marrow. Normal.

Anatomical Diagnosis. Acute phlegmonous gastritis; acute pleuritis; empyema; acute pericarditis; acute general peritonitis; erysipelas; central necrosis of the liver; septic spleen; cellulitis of the left crus of the diaphragm; necroses in the fat tissue about the cardia of the stomach; congestion and infarct of the lungs; cardiac dilatation and hypertrophy.

Sharlach R. Heart, spleen, kidney, no fat. Liver, cells about central veins contain fine droplets of fat.

Bacteriological Report. Cultures were made from the heart's blood and the walls of the stomach. From both of these sources a pure culture of Streptococcus pyogenes was obtained.

Microscopic Examination. Heart. The myocardium appears normal except that between the muscle fibers, near the epicardial surface, there are a few groups of cocci. There is no inflammatory reaction about them. The capillaries of the epicardium are deeply injected. The endocardium is normal.

Lung. Section 1: Very marked injection throughout. The alveoli are generally normal. Situated immediately beneath the pleura there is a sharply outlined area throughout which the bloodvessels and alveoli are widely distended with blood and contain a small amount of fibrin. The walls of the alveoli within this area are not distinguishable as such and are represented by faint eosin-staining bands except those just beneath the pleura, where they are better preserved. Section 2: The alveoli contain desquamated epithelium and large cells phagocytic to pigment.

Spleen. The Malpighian bodies are normal. The pulp contains a great deal of blood, in some places obscuring the lymphoid elements. There are several groups of cocci in the sinuses. The capsule is infiltrated with lymphoid and plasma cells. The arteries show some hyaline change.

Liver. The bloodvessels in the portal tissue are distended with blood. The liver cells occur as single isolated cells and short columns and groups of cells. The latter are in the peripheral portions of the lobules, are sharply separated from an inner hemorrhagic zone, and they stain deeply with eosin. There are but few liver cells recognizable in the midzonal and central portions of the lobules. They are irregularly distributed, stain poorly, generally contain vacuoles, and show varying stages of degeneration. The anatomical situation of the columns of liver cells in the inner two-thirds of the lobule is represented by poorly defined intercommunicating bands of eosin-stained material composed of a small amount of fibrin, finely granular eosin-staining material, an occasional poorly staining liver cell, a few polymorphonuclear leukocytes, numerous red blood corpuscles, cocci and endothelial leukocytes filled with yellowish pigment. The sinusoids at the periphery of the lobules are easily distinguished and contain coagulated serum and blood cells, but throughout the inner two-thirds of the lobule the sinusoids, as a rule, cannot be made out. There is no increase of connective tissue. The capsule contains a few lymphoid and plasma cells and polymorphonuclear leukocytes.

Pancreas. Normal.

Kidney. Marked injection of the bloodvessels. The epithelium of the convoluted tubules is swollen, granular, projects irregularly into the lumina, and stains poorly. The epithelium of the collecting tubules is for the most part desquamated. The glomeruli are injected, and show some hyaline change in the walls of their capillaries. Capsule normal.

Adrenal. Marked injection of its bloodvessels. There are a few lymphoid and plasma cells, and groups of cocci in the medulla.

Stomach. The following description is based upon a number of sections taken from the cardiac half of the stomach and stained by several methods.

The bloovessels are everywhere distended with blood. The mucosa, submucosa, and muscular coats show an infiltration with cells of acute inflammation. The mucosa for the most part shows only a slight degree of cellular infiltration. The lumen of some of the glands are distended with polymorphonuclear leukocytes, and in some places there are small areas of necrosis, situated both in the superficial and deep layers of the musoca.

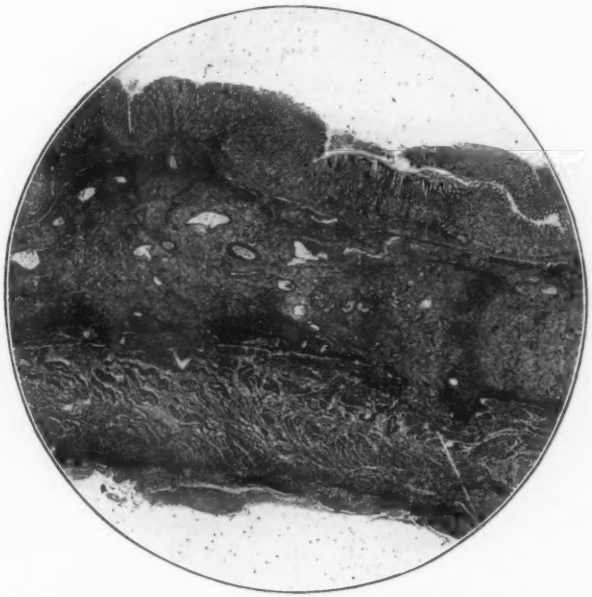

FIG. 1.—Section of stomach (low power). Note the thickened, infiltrated submucosa. The dark area to the right is shown in Fig. 2.

Between the tissues of the muscularis mucosa there are a few cells similar to those seen in the submucosa. The submucosa shows extensive necrosis, and is greatly thickened by polymorphonuclear leukocytes, small lymphocytes, red blood corpuscles, and coagulated serum. Polymorphonuclear leukocytes predominate and occur diffusely distributed through the tissue, and in small compact areas that are due to lymphatics which are distended by these cells. A similar exudate is seen in the muscular coat, but the tissues

of which it is composed are not separated as much as those of the submucosa.

There are numerous groups of cocci in the stomach wall.

A section through the esophagus at the cardiac opening of the stomach shows the submucous and muscular coats infiltrated with exudate similar to that in the stomach.

Intestine. Normal.

Lymph Node. (From the gastrohepatic omentum.) The sinuses are distended with blood. There are numerous polymorphonuclear leukocytes in the pulp and sinuses, and in the sinuses there are also many endothelial leukocytes, phagocytic to cells.

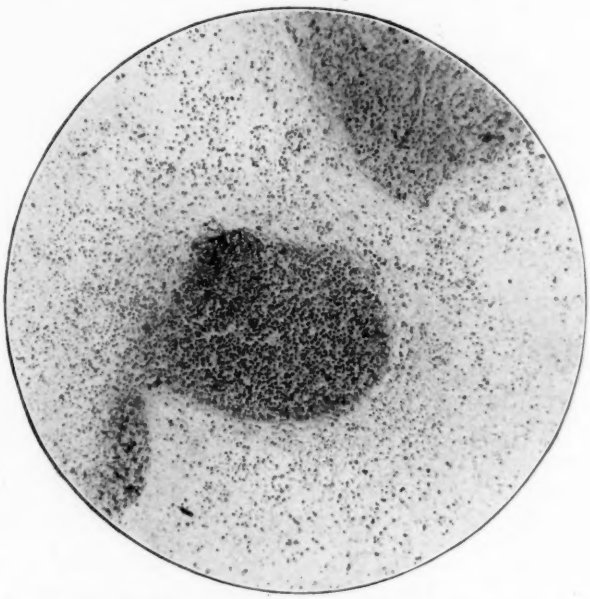

FIG. 2.—Submucosa (high power), showing lymphatics distended with polymorphonuclear leukocytes.

Phlegmonous gastritis may follow lesions in the stomach itself, or it may be secondary to an acute infection elsewhere in the body, or part of a general septicemia. It is often difficult or even impossible to determine the primary lesion. This is especially true when the stomach is but one of several organs involved and the duration of the lesions in these organs is apparently the same. Even where no ulcer is demonstrable, the stomach may be considered as the primary source of infection if this organ alone is involved,

or if the acute lesions associated with it can be demonstrated to be secondary to it.

In the case reported here where there was erysipelas, acute pleuritis, acute pericarditis, acute peritonitis, and general septicemia, it is most probable that the erysipelas was primary, and the other lesions were a part of a general bacteriemia. The following may be suggested in favor of such a view: (1) Streptococcus is the common cause of erysipelas. (2) The phlegmonous gastritis in this case developed three days after erysipelas of the face. (3) There was a general bacteriemia due to the streptococcus. (4) This organism was recovered in pure culture from the stomach wall. (5) The acute lesions elsewhere in the body were apparently of the same duration as the one in the stomach, and from them the streptococcus was recovered.

In conclusion I wish to thank Dr. S. Burt. Wolbach and Dr. Lawrence J. Rhea for assistance in the preparation of this paper.

CARDIAC MURMURS DURING ATTACKS OF BILIARY COLIC.[1]

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A few years ago I called attention in a short paper[2] to the development of heart murmurs during attacks of biliary colic. Some time later, Dr. Babcock,[3] of Chicago, published an exhaustive article on the relation of the heart to diseases of the biliary tract, and within the past few months Dr. William J. Mayo,[4] in a brief but masterly discussion of diseases of the gall-bladder, made reference to concomitant heart affections. Aside from these, the literature is meager, and yet the subject has considerable practical importance. It is not my purpose to envisage the relation of the heart to the biliary tract in its entirety, but to recur briefly to the perplexing murmurs, of which, since my first paper, I have seen several additional examples. Among 56 cases of gallstone disease from private and consulting practice, 6, or 10.7 per cent., showed cardiac murmurs. This percentage does not express the real frequency of the murmur, as not all of the 56 cases were seen during or

[1] Read at the Fourteenth Annual Meeting of the American Gastro-enterological Association, Philadelphia, April 19, 1911.

[2] The Development of Cardiac Murmurs during Attacks of Biliary Colic, Jour. Amer. Med. Assoc., May 11, 1907.

[3] Chronic Cholecystitis as a Cause of Myocardial Incompetence, Trans. Assoc. Amer. Physicians, xxiv, 43.

[4] Jour. Amer. Med. Assoc., April 8, 1911.

soon after an attack of colic. I believe that if the heart is carefully examined at such times the murmur will be found in a much larger proportion of cases. Of the 6, 4 were operated upon; 1 passed five stones in the feces, and 1 has had several typical attacks, but has so far not had an operation. In 5, either the physician in attendance or I myself had examined the patient prior to the attacks and had determined that a murmur was not present. In the sixth case, a woman who had suffered from gallstone colic for seventeen years, the murmur had existed for some time before I first saw the patient.

The murmur is usually quite loud and blowing, systolic in time, and is heard best at the apex. It is not transmitted far, but at times may be heard near the anterior border of the axilla. The heart is nearly always somewhat enlarged, but the dilatation is not extreme. Soon after the attack, or after an operation if one is undertaken, the murmur disappears. In one of the cases, cited in my first paper, the patient, who had had a loud blowing murmur at the height of the attack, when seen again fifty-one days later, had normal heart sounds. An operation had been performed soon after I had seen him and a large solitary stone had been removed from the common bile duct.

Regarding the significance of the murmur, the point of chief practical importance is the bearing the discovery of the murmur may have on the attitude of the physician or surgeon toward a contemplated operation. This attitude will depend to some extent on the explanation given for the cause of the murmur. Several explanations are possible. The murmur might be due to an old-established valvular heart disease antedating the formation of the gallstones. Personally, I cannot recall such a case. I have seen active pulmonary tuberculosis and gallstone colic together—and a more pathetic picture than that presented by the unfortunate woman so afflicted can scarcely be imagined—but never have I observed a genuine attack of biliary colic in a patient with typical endocarditis that had preceded the gallstone disease. (I do not, of course, mean to infer that such a condition is impossible.) In the sixth case cited above, in which the murmur had probably been present for some time, the gallstone disease had existed many years before the murmur appeared.

The murmur, I take it, is a sequel or an effect of the gallstone disease. It is probably not due to an acute endocarditis, since it disappears, as I have said, soon after the attack of colic or after an operation. It cannot be attributed to the jaundice, for it is found in cases without, as well as in cases with jaundice. I am of the opinion that the murmur depends on a myocardial weakness with temporary relative insufficiency of the mitral valve. At first I was inclined to attribute it chiefly to the pain, but wider experience has led me to the conclusion that the chronic infection of the biliary passages present in many cases of gallstone disease leads to a

degeneration of the myocardium.[5] During the attack of pain there is a sudden rise in blood pressure, and this is the exciting cause of the dilatation and of the mitral murmur.

I was confirmed in the views here expressed by the following case: Mrs. R. M., aged sixty-one years, had had one or two attacks of biliary colic prior to the one in which I first saw her. I found a mitral murmur and a slight degree of jaundice. The murmur disappeared within a few weeks. After a period of several months' comfort, another attack of colic occurred, and the murmur returned. Though the pain and the acute tenderness in the gall-bladder region accompanying this attack quickly subsided, the patient was left with a peculiar condition characterized by sudden alarming attacks of cardiac dilatation. These would come on without warning and be accompanied by intense dyspnea—orthopnea, marked cyanosis of the lips and face, usually a fear of impending death, and great prostration. The murmur, though less loud, persisted. No medicine or regimen seemed to have any influence on the condition, and gradually the patient became more and more despondent and feeble. Fearing that the attacks would ultimately prove fatal and that surgical intervention involved the lesser risk, the patient was advised to have an operation. Because of the cardiac attacks rather than because of the presence of the murmur itself, we were anxious as to the outcome, but the patient had a good convalescence, despite an ether pneumonia of limited extent. A single stone was found in the common duct. Since the operation about ten months have elapsed and the patient has had no return of her former attacks and the murmur has long since ceased to be audible.

There can be no doubt that the gallstone disease and the alarming attacks of cardiac dilatation stood in relation of cause and effect. When the one was removed, the other disappeared—*sublata causa, tollitur effectus*. The murmur, which disappeared with the improvement in the condition of the heart, must have been the result of the myocardial degeneration induced by the gallstone disease.

The case further indicates that even in the presence of serious weakness of the heart muscle, an operation may be well borne. With regard to the murmur, experience leads to the conclusion that it should not be looked upon as a contraindication to operation. Rather should it be viewed as an indication for surgical intervention, as it implies the existence of a myocardial degeneration that will grow worse if the gallstone disease is allowed to continue. Care should of course be taken to make the operation as brief as possible, and to have a competent anesthetist. The immediate after results of the operation do not seem to be complicated by the cardiac condition.

[1] A condition somewhat analogous is found in certain cases of fibroid tumor of the uterus.

It has occurred to me that the murmur might also have a diagnostic value. Given a case of repeated attacks of severe epigastric pain of obscure nature, in which angina pectoris and the crises of locomotor ataxia have been ruled out, the development of a murmur should put us upon our guard as to the possibility of gallstone disease.

I may add in conclusion that I have recently examined a number of cases of renal colic at the height of the attack without finding any cardiac murmur.

HUMAN TRYPANOSOMIASIS.[1]

REPORT OF A CASE, WITH SPECIAL REFERENCE TO THE TREATMENT.

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The case of trypanosomiasis, here reported, contracted the disease in June, 1907, on the Congo, above Stanley Pool. Fever appeared on July 12, 1907, and the parasites were found by Dr. Broden, at Leopoldville, on the 19th, and treatment was immediately begun. The patient remained in Africa until the autumn, when he returned to England. At Liverpool, Dr. Breinl (Liverpool School of Tropical Medicine) repeatedly found parasites. In October, 1907, he went to London, where he was under the care of Sir Patrick Manson,[2] who has reported the findings up to December, 1907, at which date the case was referred to me by Sir Patrick Manson.

The following record covers a period of four years of almost continuous observation. The patient had repeated paroxysms of fever from December, 1907, to November 10, 1910, about three years. During this time, part of which he lived in my house, he was under constant observation. Since the subsidence of fever he has been under examination from time to time, and continues so up to the present, October, 1911.

It is the object to report here more especially the treatment employed, introducing the clinical features of unusual importance only, or such as have relation to the treatment.

Ten years only have elapsed since the trypanosome was detected in man by Forde, at Gambia (1901), and confirmed and named by Dutton, Trypanosoma gambiense. It is less than this (about

[1] Read before the Association of American Physicians, May 10, 1911.

[2] Ann. Trop. Med. and Parasit., March, 1908, ii, No. 1, 46.

eight years) since trypanosomatic fever was recognized (by Castellani Bruce, Nabarro, Greig, and others) as the first or earlier stages of sleeping sickness. The total number of cases in Europeans which have come under observation is now 50,[3] in which is included the present case. The present case is the first, so far as the writer knows, which has come under continued observation in America.

Is the Disease Curable? It is now generally agreed that cases treated in the early stage (trypanosomatic stage) may recover, while those in the latter stage (sleeping stage) practically never recover. It is also recognized that the disease, like syphilis, is very chronic, with long periods of latency. Bearing in mind these facts, then, all conclusions with regard to cures should be taken with reservation until sufficient time has elapsed (placed by Todd[4] at eight years), and an adequate number of cases have been observed to make such conclusions reasonably certain.

Plan of Attack. Through the labors of Ehrlich,[5] the treatment of trypanosomiasis has been taken from the realm of empiricism to that of rationalism. While this rational treatment is far from conclusively proved, it offers the only intelligent plan of attack and defence in the fight against the trypanosome.

Underlying Therapeutic Principle. Drugs used in the treatment are studied with regard to their action upon the organism (organotropism) and upon the parasite (parasitropism). The fixation of the drug, by the chemoreceptors in the protoplasm of the parasite is the underlying principle of parasitropism, and upon this depends the efficiency of a drug in destroying the parasite.

The experimental evidence upon which this theory is proved is as follows: Drugs were found to be parasiticidal in varying degrees under different circumstances; thus, a drug which destroys the parasite in vitro may have no effect in vivo, and vice versa; or the effect may be both in vitro and in vivo; or there may be no effect under either circumstance.

All drugs then (with regard to their efficiency in destroying trypanosomes) fall under the following classification:

In Vitro.	In Vivo.
0	0
+	+
+	0
0	+

There is a fifth and very important, though as yet imperfectly understood, action. Here no changes either in morphology or motility take place in the parasite when subjected to the action of the drug in vitro, and no change in the course of the disease at first when the drug is introduced in vivo. Later, however, under

[3] Bagshawe, Bull. of the S. S. Bureau, 1910, ii, No. 20, 277.
[4] Archives of Internal Medicine, April 15, 1911, vii, No. 4, 500.
[5] Chemotherapie von Infektionskrankheiten, Zeitschr. f. ärztliche Fortbildung, 1909, vi, No. 23.

the influence of the drug, the disease terminates in complete recovery. This is supposed to be due to a destructive action upon the reproductive power of the parasite. By this destructive action, one generation only of parasites is capable of maintaining the pathological features of the disease, which disappears with the life of this barren generation.

Ehrlich's explanation of the first three in this classification, namely, the OO, ++, +O, is not difficult to understand. In the first there is no parasitropism under any circumstance. In the second, the parasitropism occurs under both conditions and the organotropism is not in excess of the parasitropism. In the third, the organotropism is in such excess of the parasitropism that the drug in vivo is valueless. For example, methylene blue has an organotropism five hundred times in excess of the parasitropism —that is to say, although there are chemoreceptors in the parasite (spirochetæ of relapsing fever) for methylene blue, these are rendered of too little value owing to the great excess of the organotropism.

The O+ is somewhat more complex. To this class belongs one of the most efficient of the drugs, namely atoxyl. It is, therefore, important to understand why in vitro it has no parasitropism, while in vivo it is more active. This paradoxical or indirect action is explained by Ehrlich as follows: Such drugs find no chemoreceptors in the parasite in vivo. When, however, they are introduced into the organism, they undergo a chemical change into another compound which in the case of atoxyl is probably paramidophenylarsenoxyd. In the latter the arsenic molecule is unsaturated and the additional affinities enable it to combine chemically, while the arsenic molecule in atoxyl has no such additional affinities and the drug is therefore inert.

The arsenic receptor of the trypanosome is adapted not to pentavalent (atoxyl) but to trivalent arsenic (paramidphenylarsenoxyd). The drugs, therefore, which concern us clinically in the treatment of trypanosomiasis are those belonging to the ++ and the O+ class.

Available Drugs. In the laboratory several hundred drugs have been experimented with, but the following are some of those which have been tested out clinically, and from these certain ones were selected for the treatment of the case here reported.

1. The arsenic and antimony group:

Arsenic: (*a*) arsenous acid; (*b*) atoxyl, arsacetin, etc.; (*c*) acelylatoxyl; (*d*) arsenophenylglycin; (*e*) salvarsan.

Antimony: (*a*) Metallic antimony; (*b*) antimony sodio and potassium tartrate; (*c*) aneline antimony tartrate; (*d*) antimonytheoglycolic acid compounds.

2. Azo dyes group: (*a*) Trypan red; (*b*) trypan blue; (*c*) trypan violet.

3. Basic triphenylmethane dyes group: (*a*) Parafuchsin; (*b*) pyronin; (*c*) trypanosan.

Choice of a Drug. In selecting a drug, the stage of the disease and treatment previously employed must be taken into consideration.

In the early stage atoxyl (O+) is accepted at present as *the* drug. (1) Should atoxyl be used in the early stage only? or (2) should it be used for a period and replaced by another drug to be again used for a period ("ringing the changes," as Todd[6] well expresses it)? or (3) should the drug be continued, in small doses, for long periods irrespective of the course of the disease? In the continued use of this or any arsenic compound, animal experiments have shown that the great danger is that there may develop a generation of trypanosomes with resistance to arsenic (resistant strains). With regard to this, the authorities differ—Ehrlich cautions against the danger, pointing out that a case of trypanosomiasis with a resistant strain of parasites is worse off than one on whom no treatment has been instituted. Manson,[7] who has had a large percentage of recoveries, advises, on the other hand, the continued administration of small doses of arsenic. He says: "I would therefore suggest for the routine treatment of trypanosomiasis a 2- to 3-grain dose of atoxyl every second or third day and kept up for *at least two years*."[8] According to the laboratory studies the development of resistant strains renders the trypanosomes invulnerable to almost all drugs. Perhaps the safest plan is to procure from time to time specimens of blood from a patient under arsenic treatment and by animal inoculation determine whether trypanosomes, resistant to the drug, are present. Closely allied to this consideration is the hypersensitiveness to ordinarily harmless doses of other drugs, acquired by one who has been taking certain preparations over a considerable period. Thus Ehrlich[9] warns against the toxic effect of even small doses of arsenphenylglycin upon one who has been under atoxyl treatment.

Dosage. Regarding the dosage, it must be remembered that the drugs employed belong to a highly toxic class, and that in their behavior they are as deadly as the disease; no drug, except in desperate cases, whose efficient dose is eight- to nine-tenths the lethal dose should be employed. The danger is too great. This danger is, however, offset by the fact that it is rarely necessary to increase the dose if once the quantity necessary to destroy the parasites is determined. This is true of antimony especially. Plimmer,[10] in speaking of intramuscular injections of antimony, advises against "pushing the dosage."

[6] Private correspondence.
[7] Loc. cit.
[8] Italics not in original.
[9] Private correspondence.
[10] Private correspondence.

On the other hand, a dose (of arsenophenylglycin) too small to destroy the parasites will not become efficient by allowing intermissions between the doses. On the contrary, the trypanosomes will develop resistance and the body will become hypersensitive. This intermittent treatment with small dosage is, therefore, condemned by Ehrlich as ineffectual and tending to produce resistant strains and body hypersensitiveness.

Summary. When the views of the authorities are summed up, we are led to conclude as follows:[11] The arsenic and antimony group of drugs offers the best ammunition with which to attack the trypanosome in the early stage of the disease. An exact dose should be ascertained by observing what quantity of a drug is necessary to rid the blood of parasites. Once this is found, no more and no less should be given. Treatment, with some parasiticide, should be continuous. No drug should be continued for too long a time, but frequent changes should be made (see below).

I add the opinion of Manson,[12] who has treated 10 cases in Europeans, with 3 deaths and 7 "apparently well," the case here reported being one of the 7. He says: "I am a believer in small doses of antitrypanosomiasis drugs—at least the arsenic and the antimony ones—considering that a persistently unfavorable[13] medicine is of more use than an intermittently unfavorable one." And again: "I do not believe we can kill the trypanosome outright by one or two large doses of atoxyl any more than we can kill the treponema of syphilis or the parasite of malaria by large doses of their respective specifics. Mercury does not immediately cure syphilis, nor does quinine immediately cure malaria; but they deprive the respective parasites of their pathogenic qualities and keep the patient alive and in good health until, in process of time, the parasites either die out or become permanently inert. So I read the action of atoxyl in traypanosomiasis, and so I would regulate its administration, being careful, as we would with mercury or quinine, not to push the drug too far, and thereby necessitate its suspension."[14]

The development and maintenance of the body resistance is placed by many authorities among the most important requisites. Thus Bagshawe[15] says recovery "may be attributed to the resisting power of the human organism at least as much as to the treatment." Manson[16] says: "I regard a high level of general health as of the utmost importance in the management of these cases." Again Manson[17] says: "The patient should be brought home to his

[11] For a good summary of Ehrlich's views see the Chemotherapy of Ehrlich, with Special Reference to the Trypanosome Injections, B. T. Terry, M.D., Medical Record, New York, April 8, 1911.

[12] Private correspondence.

[13] "Unfavorable" to the life and development of the parasite.

[14] Loc. cit.

[15] Loc. cit.

[16] Private correspondence.

[17] Loc. cit.

native country, be spared fatigue, worry, exposure, excess of all kinds, and be placed in the most favorable hygienic conditions possible."

Clinical Report. Before presenting the clinical findings in detail, I will give here a complete list of the symptoms and signs so far recorded in all cases, arranged according to their presence or absence in the case here under consideration:

Present in this Case.	Not Present in this Case.
Stinging sensation upon some exposed body surface. On hand in this case; thought at time to have been prick of thorn; no painful swelling followed.	Loss of weight and strength.
Fever.	Edema.
Erythema of skin.	Anemia.
Enlarged cervical glands.	Enlarged liver.
Itching of arms, legs, and body.	Epistaxis.
Large spleen.	Diarrhea.
Vomiting.	Delirium.
Loss of hair (scalp).	Tremors.
Headache.	Eye symptoms.
Insomnia.	Deafness.
Inertia—not loss of strength, but profound disinclination to mental or physical effort.	Phlebitis.
Depression. Melancholia, at times profound.	Orchitis.
Hyperesthesia, deep (Kerandel's sign).	Incontinence (urine and feces).
Severe aching in legs.	Dermatographia.
Loss of weight (temporary).	Paresthesias.
Pain in extremities; legs only in this case.	Vertigo.
Pain in long bones.	Changes in character.
	Facial paralysis.
	Epileptic seizures.
	Somnolence.
	Delusions.

As already stated, the findings from June 22, 1907, to December 12, 1907, in this case have been published by Manson[18] and Bagshawe,[19] and I quote here from the former's report:

"An engineer, aged thirty-five years, arrived at Boma, Congo River, on June 22, 1907. He was then in perfect health, and proceeded at once up country to a point about one hundred and fifty miles above Stanley Pool, where he and his companions camped on the river bank from June 28 until July 17. Four days after his arrival there he began to ail with anorexia, depression, languor, drowsiness, and on July 12 took to his bed with fever (102°). On July 17 his temperature had reached 107°. Next day he was brought to Leopoldville (fever, 104°), and on the following day, July 19, Dr. Broden found trypanosomes in his blood. He received a large dose (I understand 1.5 grams) of atoxyl hypodermically on the 20th. This gave rise to violent gastralgia, but on the 21st his temperature had become normal and has remained so ever since, with the exception of slight brief rises (99.5° to 102.4°), which recurred with some regularity every fortnight or three weeks. On July 23 daily injections of 0.25 gram of atoxyl were commenced and, with occasional intermissions of a day or two and increases of the dose

[18] Loc. cit.

[19] Loc. cit.

to 0.5 gram, were continued until his arrival in Liverpool about the middle of October, 1907.

"Trypanosomes were unusually persistent in the peripheral blood in this case. Dr. Broden found them when the patient was at Leopoldville every time he looked for them. Dr. Breinl, who examined him on his arrival in Liverpool, found them, notwithstanding intensive doses of atoxyl, on each of five successive days; and I found them whenever I examined the blood—that is, on every alternate day—between October 23 and November 8. When I saw the patient for the first time on October 23, he informed me that he had no cutaneous eruption, and that only once—during the initial fever, when one slightly enlarged gland was detected on the right side of the neck—any adenitis. An inflamed patch of skin on the dorsum of the right foot, which began on September 20, and which he attributed to prickly heat, had almost disappeared when I saw him. The spleen was slightly enlarged, and he looked more anemic than his blood count (4,000,000) indicated. Appetite was poor and he felt weak and depressed. There was no palpitation or breathlessness, and no headache even when he had fever. The only pain he remembered was intense aching in the legs, coming on every night and keeping him from sleeping; this disappeared when he left Leopoldville, and has not recurred.

"On November 8, trypanosomes being present in small numbers in his blood and temperature being normal, for the first time during his illness the characteristic erythema showed itself on the skin of the trunk. At the same time and for a day or two previously he had been profoundly melancholic, so much so that I feared the nervous system was becoming implicated and that the terminal phase of the infection was about to set in. He was so depressed that I was afraid to let him go out alone. On the day the erythema appeared (November 8) I gave him a hypodermic injection of $\frac{1}{2}$ grain of sodio tartrate of antimony, and also on the following days 1, $1\frac{1}{2}$, 2, and 3 grains respectively, and again after two days another 2 grains. The apparent effect of these injections was remarkable. By the third day the erythema had disappeared, his spirits had become good, and for the first time trypanosomes could not be found in his blood. This hopeful condition persisted until November 26, when depression, though not so intense as on the former occasion, returned and trypanosomes in greater number than I recollect to have seen them in human blood were once more found. On November 26 and 27 he had 2 grains of antimony by the mouth. I was afraid to resume the antimony injections on account of the intense irritation and pain they gave rise to. Given by the mouth the drug caused nausea and seemed to increase the depression. It was stopped, therefore, and atoxyl resumed. By the 30th trypanosomes had again disappeared and the patient was feeling much better. He left for New York on December 12, with instructions to continue the atoxyl."

To this record of Sir Patrick Manson I would add the following: Five or ten days before the initial fever the patient experienced a sharp, stinging sensation on his hand, which he thought due to a prick of a thorn. There was no swelling or local redness. I wish to draw attention also (see temperature chart) to the character of the fever from November 9 to December 9, 1907, associated with and following the hypodermic injections of antimony. This fever is almost a counterpart of that occurring from January 1 to 24, 1909 (see temperature chart), when intramuscular injections of antimony were given. These two fever periods should be compared with the trypanosomatic febrile paroxysms and that associated with the intravenous injections of antimony (see temperature chart for February 1 to 15, 1910), to be described in detail later.

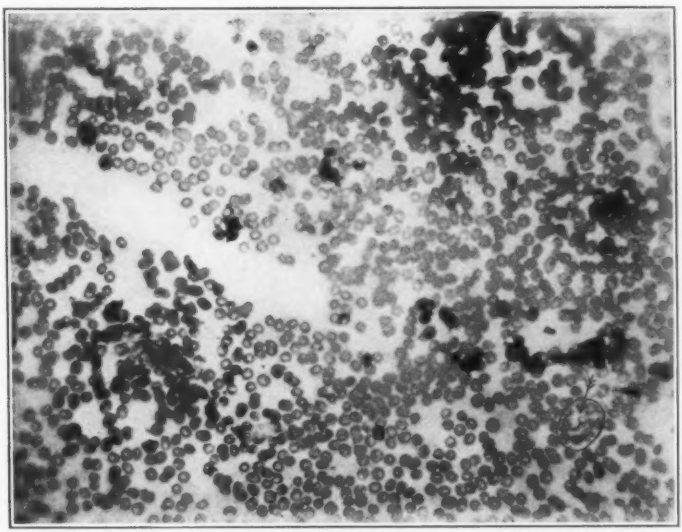


FIG. 1.—Trypanosoma gambiense, as observed in this case. Note relative size and number of erythrocytes to parasites. (Photograph by Dr. Auchincloss.)

I saw the patient for the first time on December 26, 1907. At that time he was in good spirits, energetic, but rather pale; the anterior and posterior cervical glands were palpable, and about the size of a pea; also the axillary glands, which were about the size of an almond; they were not tender. The epitrochlear glands were not palpable, though there was a history of lues which had received active treatment. There was some periosteal thickening of the shin bones, but no tenderness. The skin was clean but very dry and scaly, which he says at night becomes red and itchy, especially over

the shins. The swellings caused by the hypodermic injections of antimony (given November 9, 10, 11, 12, 13, and 14, 1907) were still present. Blood was negative for trypanosomes. Hemoglobin, 90 per cent. The spleen was not palpable.

January 8, 1908. Last evening he spent at my house; he was perfectly well then. Today he has a temperature of 102.4°. This paroxysm of fever is the fifth since date of infection (see temperature chart, paroxysm V). Blood shows abundance of trypanosomes—parasites found in about fifteen minutes (see Figs. 1 and 2).

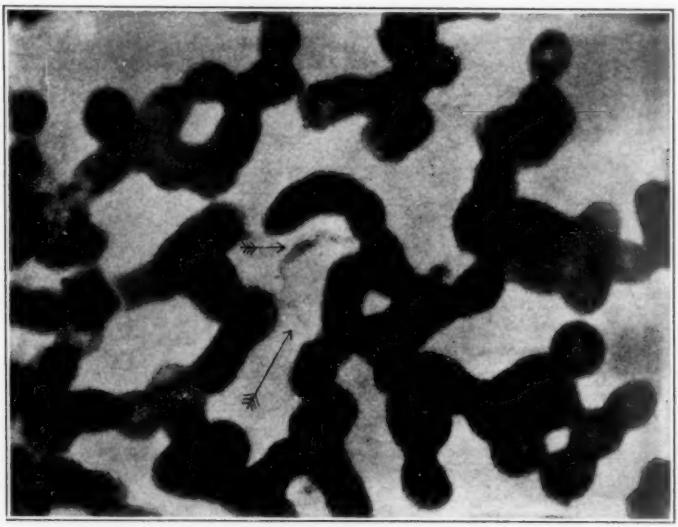


FIG. 2.—Trypanosoma gambiense, as observed in this case. Note the flagellum (long arrow) and nucleus proper (short arrow). The undulating membrane and micronucleus cannot be seen. (Photograph by Dr. Auchincloss.)

January 9, 1908. Trypanosomes absent—5 white rats inoculated with blood.

January 30, 1908. Large patch of erythema on thigh and abdomen.

March 16, 1908. VI. Paroxysm of fever (see temperature chart); nausea, bone pains, and debility.

April 14, 1908. VII. Paroxysm of fever (see temperature chart); trypanosomes present, nausea, vomiting, pains in legs.

April 27, 1908. VIII. Paroxysm of fever (see temperature chart); nausea, pains in legs, depression,

May 19, 1908. Deep hyperesthesia over superficial bones (Kerandel's sign).

May 25, 1908. IX. Paroxysm of fever (see temperature chart).

June 9, 1908. X. Paroxysm of fever (see temperature chart); great depression and weakness.

June 25, 1908. XI. Paroxysm of fever (see temperature chart); great depression and weakness.

July 3, 1908. XII. Paroxysm of fever (see temperature chart); great depression and weakness.

From July 12, 1908, to November 22, 1908, there was irregular and continued fever with no marked paroxysm (see temperature chart). During most of this time the patient was feeling well. He had slight depression and occasional nausea when temperature reached 99°, which it did six times. On three occasions it reached 100°. Thus, in three and one-half months temperature was above normal nine times, but not above 100° (see temperature chart). During August and September patient was in the Canadian woods. His weight steadily increased, coming from 154½ pounds (March 3, 1908) to 161 pounds (October 24, 1908).

November 24, 1908. XIII. Paroxysm of fever (see temperature chart).

November 28, 1908. Trypanosomes absent. Cervical glands punctured. Trypanosomes absent (examined by Dr. J. L. Todd). Two rats inoculated with blood and glandular fluid.

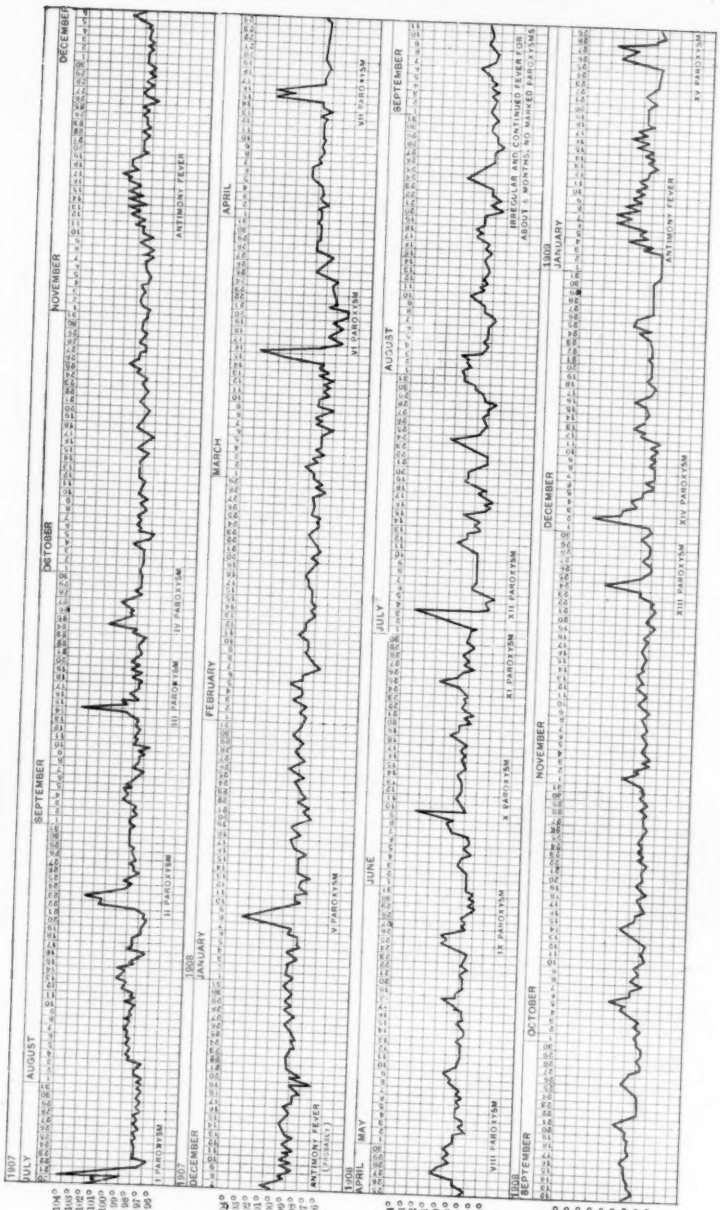
December 3, 1908. XIV. Paroxysm of fever (see temperature chart); nausea and depression.

December 10, 1908. Trypanosomes present.

December 12, 1908. Blood viscosity; 7.7 times water (5.1 normal) (Hastings). Blood osmic tension, water value, 45.9; blood value, 46 (Hastings). Blood alkalinity; Fl. 0.380 in NaOH per 100; disod. perc., 0.020.

Treatment (from December 9, 1907, to December 6, 1908. Atoxyl hypodermically). Atoxyl, 3 grains hypodermically administered every other day, was the only medicinal treatment during this period of one year. On November 24 and December 3, 1908, there were sharp paroxysms of fever (see temperature chart), with nausea and depression; and on December 12, 1908, trypanosomes were present in the blood. The cervical glands were, however, free from trypanosomes. Fevers following one another in such quick succession and the presence of trypanosomes were decidedly unfavorable signs. Coming, too, after a period of six months of general improvement, which was associated, however, with irregular fever, caused anxiety lest a generation of atoxyl-fast parasites had developed.

December 6, 1908, to December 22, 1908 (arsacetin hypodermically). Brief trial of arsacetin was made, but on December 22 all arsenic medication was discontinued. On this date the blood showed a red cell value of 5,200,000; hemoglobin, 85 per cent.; color index, 0.83; white blood cells, 8000, with a slight polymorphonuclear increase.


1907
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
I PARO XSM
II PARO XSM
III PARO XSM
IV PARO XSM
ANTIMONY FEVER
1908
JANUARY
FEBRUARY
MARCH
APRIL
V PARO XSM
ANTIMONY FEVER
(?GLOSSY)
VI PARO XSM
VII PARO XSM
MAY
JUNE
JULY
AUGUST
SEPTEMBER
VIII PARO XSM
IX PARO XSM
X PARO XSM
XI PARO XSM
XII PARO XSM
IRREGULAR AND CONTINUED FEVER FOR
ABOUT 5 MONTHS, NO MARKED PARO XSMS
1909
JANUARY
XIII PARO XSM
ANTIMONY FEVER
XIV PARO XSM

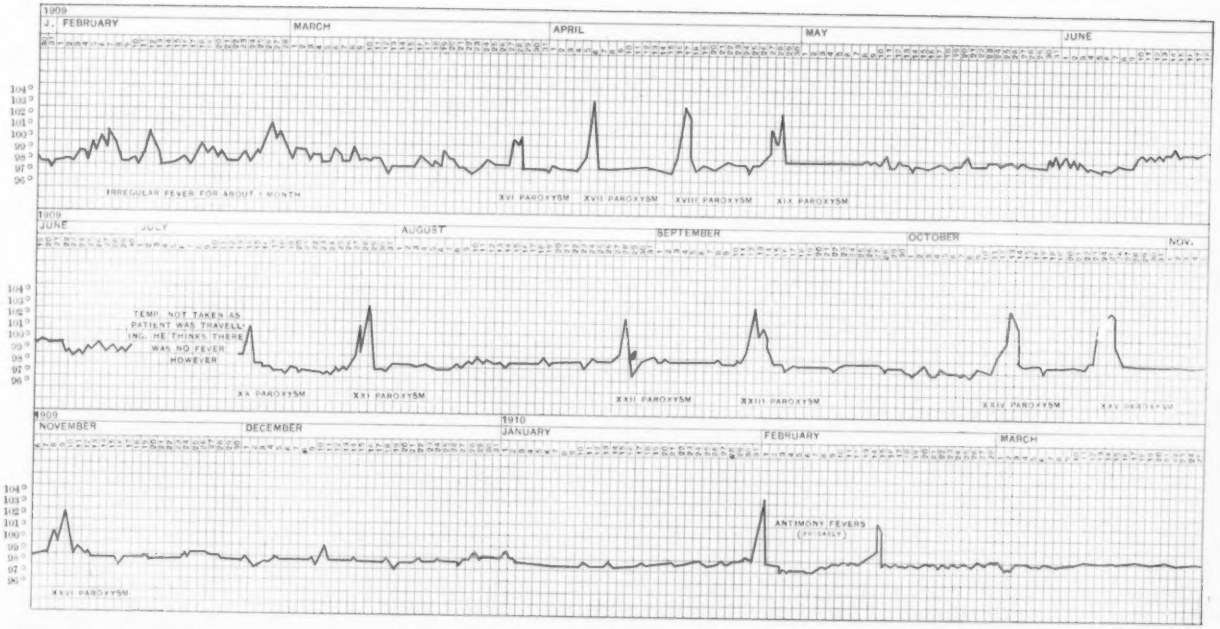


FIG. 3.—*Temperature Chart.* Continuous record of temperature from date of infection, June, 1907, to date of disappearance of fever, March, 1910, two years and ten months. Antimony fevers occurred November, 1907, January, 1909, and February, 1910. Trypanosome fevers numbered twenty-six. The last fever attributable to trypanosomes occurred November 9, 1909. Last fever of any origin occurred February 14, 1910. In the text will be found a record of the clinical features and treatment employed in connection with each of the febrile phases represented in above chart.

Antimony medication was now seriously considered, but no preparation sufficiently safe could be procured in this country for intramuscular and intravenous injection. From Messrs. Larimore & Co. a solution of antimony lithium tartrate, prepared with great care, was procured for administration by mouth.

December 16, 1908 (antimony lithium tartrate by mouth). One and one-half grains of this preparation in three pints of water was taken by mouth daily. About this date Sir Patrick Manson was cabled to, and from him two preparations of antimony were received.

January 3, 1909 (precipitated metallic antimony intramuscularly). On this date 10 minims, equal to one-half grain, of precipitated metallic antimony in Lambkin's oily medium was injected into the muscles of the buttock. This preparation was the identical one which had been tested by Plimmer in the treatment of syphilis in one of the British military hospitals.

Within an hour after the injection the patient experienced in the buttock great discomfort, which increased until the whole buttock was greatly swollen, painful, and tender, to such a degree that the least pressure of his body upon the bed caused him to call out with pain. Even with such cause removed, the pain was so intense that morphine had to be frequently administered. This condition, accompanied with sleeplessness, lasted for ten days, when the swelling, pain, and tenderness gradually subsided, and within a fortnight from date of injection the patient was able to walk about, and two days later all inconveniences had disappeared. When the area of swelling had lost the tenderness sufficiently to allow of palpation, it was found to be tense, hard, and fairly sharply defined to a circular area of about 18 to 20 cm. in diameter. There was no necrosis. The temperature was as is shown in the accompanying chart (see temperature chart of January 3, 1909).[20]

The temperature curve during this period seems to be quite characteristic when compared with that of November 9, 1907, at which date antimony was given hypodermically.

In speaking of his results with this identical preparation, Plimmer[21] says: "In the cases at Millbank none of the men had to lay up, not even after 20 minims, and the pain lasted only a few days and none suppurated," and Manson[22] says: "It may be injected once every one, two, three, or four weeks. The maximum dose hitherto used has been 20 minims (it is a 5 per cent. mixture), equal to 1 grain. They begin with 10 minims; . . . a little local irritation may follow."

Janurary 14, 1909 (antimony by mouth). Antimony sodio tartrate, which had been discontinued on January 4, 1909, owing to his condition, was on this date again taken by mouth in amounts of 1½ grains in 3 pints of water daily. The urine was negative.

[20] Camac, Amer. Jour. Med. Sci., August, 1911.

[21] Private correspondence.

[22] Private correspondence.

January 27, 1909. XV. Paroxysm of fever (see temperature chart); marked depression. Condition of patient now seemed very unfavorable. Though there were no trypanosomes in the blood and rats inoculated with the blood and cervical gland fluid were negative, there was apparently a resistance to atoxyl. Intramuscular injection of antimony was out of the question.

January 28, 1909, to February 18, 1909 (atoxyl hypodermically). Sir Patrick Manson's advice to continue small doses of atoxyl for "at least two years" and his good results in so doing seemed to justify resuming the atoxyl hypodermically. This was done, three grains being given thrice weekly. Antimony by mouth daily also was given. Irregular fever continued for about one month.

February 18, 1909 (antimony intravenously). On this date $\frac{1}{8}$ grain of antimony sodio tartrate in normal saline was injected into the vein of the arm. This preparation also was received from Sir Patrick Manson and Mr. Plimmer, as mentioned above. Atoxyl was discontinued on February 17, 1909, but the antimony by mouth daily was continued.

February 25, 1909. One-quarter grain antimony sodio tartrate intravenously injected. Urine negative.

On March 4, 9, 13, 18, 23, 27, 1909 (that on the last date being the eighth injection), he had $\frac{1}{8}$ grain antimony sodio tartrate injected intravenously. Negative findings in urine.

March 27, 1909. XVI. Paroxysm of fever (see temperature chart).

April 6, 1909. One-quarter grain antimony sodio tartrate, intravenously injected.

April 6, 1909. XVII. Paroxysm of fever (see temperature chart).

April 12, 1909. One-eighth grain antimony sodio tartrate intravenously injected.

April 17, 1909. One-sixth grain antimony sodio tartrate, intravenously injected (being the twelfth injection).

April 19, 1909. Atoxyl, 3 grains hypodermically begun and taken thrice weekly until October 30, 1909.

April 28, 1909. XIX. Paroxysm of fever (see temperature chart).

May 4, 1909. Antimony by mouth discontinued.

From May 1, 1909, to July 14, 1909. Patient left for Western States and the Canadian Northwest. Headache constant, not severe; sleep much disturbed; no fevers.

July 14, 1909. XX. Paroxysm of fever (see temperature chart).

July 29, 1909. XXI. Paroxysm of fever (see temperature chart). Weight, 156 pounds.

August 16, 1909. Erythema on right leg, lasting about a month.

August 28, 1909. XXII. Paroxysm of fever (see temperature chart).

September 13, 1909. XXIII. Paroxysm of fever (see temperature chart). Weight, 161 pounds.

October 9, 1909. Antimony lithium tartrate 1.5 to 2 grains in 3 pints of water by mouth daily.

October 13, 1909. XXIV. Paroxysm of fever (see temperature chart).

October 25, 1909. XXV. Paroxysm of fever (see temperature chart).

October 30, 1909. Atoxyl discontinued.

November 1, 1909. Returned to New York after a successful journey through the west. His condition was excellent and he had been fairly free from nausea, depression, sleeplessness, and headache. The fevers were, however, quite severe and frequent (see temperature chart). It was therefore determined to again give the antimony by the vein.

Arsenophenylglycin Considered. At this time arsenophenylglycin was considered and a preparation procured from the Rockefeller Institute from Dr. Flexner, who had received it from Professor Ehrlich. Upon the advice of Professor Ehrlich,[23] however, it was not used. He cautioned against using it after prolonged administration of other arsenic preparations (atoxyl) (see earlier portion of this paper for consideration of this action of arsenic compounds, p. 661).

November 9, 1909. XXVI. Paroxysm of fever (see temperature chart). *Last fever attributable to trypanosomes* Trypanosomes present in the blood. Two white rats inoculated with blood. One sent to Dr. Todd to test for atoxyl-fast trypanosomes.

Antimony Intravenous Injection. One-sixth grain antimony sodio tartrate intravenously injected. This injection was repeated November 15, December 2, 7, 13, 23, 28, January 3, 10, 15, 25, and February 1, 1910, about 11 A.M. About twenty minutes after leaving the laboratory, while on his way home, the patient was suddenly seized with nausea and great weakness. He managed to reach his home unaided. Before I could get to him he had had a chill and violent abdominal pain. When I saw him he was greatly prostrated, complained of intense headache, and had a temperature of 103.6° (see temperature chart). This lasted five or six hours, subsiding to normal. The blood was negative for trypanosomes. The urine showed great excess of indican, otherwise it was normal. For twelve days the weakness and abdominal distress continued, and on the thirteenth day from the former paroxysm he had, for six hours, a similar but somewhat less severe attack (see temperature chart). Trypanosomes were not found at the time of this second fever and *have been absent upon all subsequent examinations.*

[23] Private correspondence.

The temperature curve presents very different characteristics from that of either the intramuscular or hypodermic injections of antimony (see temperature charts of November, 1907, and January, 1909), though there is some similarity to that of the trypanosome fever. No trypanosomes, however, were found in the blood with either of these rises in temperature.

The behavior of the disease subsequent to these alarming manifestations of what would seem to be antimony poisoning is most important. The last fever due to trypanosomes occurred November 9, 1909, just before the first of the second series of intravenous injections of antimony. This fever was paroxysm XXVI since the beginning of the infection. These twenty-six paroxysms of fever occurred over a period of two and one-half years (June, 1907, to November, 1909). With these fevers trypanosomes almost invariably were found in the peripheral blood. Except for the two fevers following the antimony (poisoning?) injections no fevers have occurred to date, October, 1911, nearly two years, and trypanosomes have not been found in the blood. For a few months atoxyl was resumed for its tonic effect, and then all trypanosomatic medication was discontinued.

April 14, 1911. A monkey (Rhesus) and a rat were inoculated, intraperitoneally, with peripheral blood. Also a monkey (Rhesus) and a mouse with spinal fluid. These animals have remained normal to date, October, 1911. The direct examination of the blood and spinal fluid was negative for trypanosomes.

The patient has engaged in some business undertakings; he finds himself, however, easily depressed by ordinary business reverses. This depression has at times been of rather a serious grade, and he cannot stand oppressive summer heat. With these exceptions there are no other abnormal manifestations.

Conclusions. As remarked at the beginning of this communication, sufficient time has not elapsed since trypanosomiasis was definitely known to be an early stage of sleeping sickness, in which to determine the duration of this disease.

Bagshawe's[24] summary of the 50 cases in Europeans so far recorded gives the following: "30 are known to be dead, 11 survive, and the fate of the remaining 9 is uncertain. Of the 30, 14 lived a year or more after trypanosomes were discovered and 4 two years or more. Of these, 1 lived three and one-quarter years, and 1 six years. . . . The fact that, of the 30 patients who died, 4 survived more than two years after the disease was diagnosticated, suggests that in cases which have exceeded this duration there is good hope of ultimate recovery."

The case here recorded now survives more than four years after the disease was diagnosticated.

[24] Case X of Bagshawe's series, loc. cit.

The case, mentioned above, who died six years after the diagnosis was made is quite exceptional and should be studied with due regard to all the peculiar features of the case. Todd, however, places eight years as the time limit in which a cure may be assumed.

Further criteria by which to determine whether the trypanosome is still actively present are to be found in animal inoculation. Todd gives one hundred and fifty days as the longest period in which monkeys infected with trypanosoma gambiense have remained free of symptoms. Rats usually die within a month, but three hundred and eighty-eight days is the longest time recorded without symptoms.

The record of this case is now published to date in order that it may be placed within reach of those studying the disease, but all conclusions upon the question of cure are reserved until sufficient time has elapsed to make such conclusions of value.

When this case first came under my care I was quite unfamiliar with the disease and its treatment; I have therefore many acknowledgments to make for assistance received from various sources. The antimony administrations were carried out with the assistance of Professor T. W. Hastings, of the Cornell Clinical Laboratory, who rendered me valuable aid in other respects also. From Sir Patrick Manson I have received, through correspondence, advice without which it would have been impossible to deal with so insidious a disease and with such treacherous drugs.

In the autumn of 1908 the patient and I consulted Professor J. L. Todd, in Montreal, who offered suggestions, and who made examinations already referred to. I want also to thank Drs. Terry and Cole, of the Rockefeller Institute and Hospital, for their assistance in the animal inoculations.

EXPERIENCE WITH PULMONARY TUBERCULOSIS DURING THE LAST YEAR.[1]

A CLINICAL RÉSUMÉ.

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During recent years there has taken place a world-wide agitation toward the suppression and control of tuberculosis. Laboratory research has been stimulated and a vast amount of laborious scientific work performed. An elaborate organization for the campaign

[1] Read before the National Association for the Study and Prevention of Tuberculosis, June 20, 1911.

has been perfected and innumerable associations for the study and prevention of tuberculosis have been formed. Detailed investigations pertaining to sociological and economical features have been completed and interesting conclusions reported.

An important phase of the tuberculosis movement has been the educational propaganda calculated, not only to awaken general attention but to instill into the public mind essential features of prophylaxis. The interest of the masses has been aroused through the medium of antituberculosis societies, public lectures, exhibitions, and the wide distribution of tuberculosis literature. In many communities effective results have been attained through the enactment of wise municipal ordinances and their rigid enforcement by capable administrative authorities. It may be safely assumed that much good has already been accomplished, as shown by the diminished mortality rate in a few of the larger cities. Apparently the greatest progress has been made in the cause of prophylaxis as reflected in the improved hygienic conditions of the home, workshop, school rooms, and other public buildings. It may be questioned if in the actual management of the disease, a corresponding advance has been achieved, although the comfort of many pulmonary invalids has been promoted by refuge in various institutions for hopeless cases.

A very considerable enthusiasm has been exhibited regarding new methods for the recognition of tuberculosis and the advantages of the sanatorium. A growing tendency has developed toward refinements of diagnosis and conventionalities of treatment. In the midst of the popular awakening as to the necessity of prophylactic measures, and the prevailing effort of medical advisers toward diagnostic proficiency, it is well to review certain clinical aspects of the tuberculosis movement. It is impossible in this connection to discuss the significance of rational symptoms or the varying interpretation of physical signs. Neither is it designed to elaborate details of hygienic and dietetic management. While correct conclusions as to the relative merits of the sanatorium and judicious climatic change are not always entertained, it is of present interest merely to note recent tendencies of the profession in its advisory capacity concerning a class of people requiring most competent direction.

Are pulmonary invalids today profiting by early diagnosis, conservatism of management and stability of judgment to a greater extent than a decade ago? It is possible that some information may be afforded by the experience of medical observers in various health resorts. Exceptional opportunities for a comparative clinical study of all classes are given to physicians residing in regions possessing climates so favorable as to attract patients from all sections and from long distances. This is particularly true of clinicians unattached to closed institutions which enforce rigid entrance restric-

tions. In the hope of presenting data which may prove of interest and reflect, perhaps, to some extent, the attitude of other medical observers, reference will be made to a few general and statistical observations. The results are based upon a personal experience during the past nineteen years in the supervision of over 3000 private cases of pulmonary tuberculosis the records of which have been preserved.

The unavoidable limitations and deficiencies of statistical contributions are well known. Sources of error, however, have been eliminated as far as possible and much labor expended to render the analysis accurate and simple. In a clinical retrospect of this character it is obviously appropriate to introduce only such material as may have practical significance, and permit reasonable conclusions with reference to certain important phases of the general subject.

In my earlier experience in Colorado ample opportunities were afforded to note the unfortunate results of delayed diagnosis. In most instances a comprehensive review of the history and subjective symptoms together with thorough physical and bacteriological examinations, would have sufficed to establish a much earlier recognition of the disease. While the more recent means of diagnosis were not at that time available, intelligent recourse to the old-fashioned methods would, to a great extent have prevented disastrous delay.

It was found from a compilation of statistics made some years ago that the average period of delay in 2300 patients before arrival in Colorado was eighteen months. Notwithstanding the diversified character of cases, and the relatively large proportion of those in moderately and far advanced stages, the results obtained upon the whole, were of such a nature as to dispel any possible doubt as to the advantages accruing from a wisely directed climatic change. Instances of mistaken diagnosis were then comparatively infrequent. While patients were found from time to time to have been instructed injudiciously the difficulties of subsequent management were not pronounced. Invalids, as a rule, did not entertain preconceived notions as to their individual needs, and hence were usually amenable to advice and supervision. They were duly impressed with the possible gravity of their condition and had not imbibed an idea as to the curability of tuberculosis at home. A large majority of the patients were sent away directly upon the advice of the family physician.

In November, 1909, in a paper embodying the study of 313 pulmonary invalids coming under observation since the publication of other statistics, some data were submitted suggesting changing tendencies of the profession in the diagnosis and management of tuberculosis. An interesting feature was the surprisingly large number sent to Colorado upon a mere suspicion of tuberculosis.

In ninety instances, or more than one-quarter of the cases presenting themselves for examination, the physical exploration of the chest was entirely negative, while tubercle bacilli were unrecognized in the sputum in 87. They were occasionally found, even in the absence of physical evidence of tuberculosis, and the reverse was also true in some instances. "Of the doubtful cases without either physical or bacteriological evidences of infection the tuberculin test was negative in 41." Although in 87 cases the period of indisposition had lasted merely from two weeks to four months, the average period of delay for the entire number was found to be sixteen and one-quarter months, thus corresponding rather closely with previous observations. One hundred and twenty-five, or nearly two-fifths were found to be in advanced stages, 62 dying not long after arrival, and 16 being sent home as utterly hopeless. With 90 classed as doubtful, including 41 adjudged non-tuberculous, and with 125 as very advanced, a comparatively small number were found to exhibit an infection of incipient or moderate degree. Comment was then made upon the fact that despite a positive cutaneous reaction, a definite diagnosis of an active tuberculous involvement was often subject to some doubt. While a very considerable number of such cases were thus impelled to journey long distances, many clearly tuberculous patients exhibited complications of such a nature as properly to have contraindicated their departure, persisting albuminuria being present in 25 instances, an incurable infection of the larynx in 15, and intestinal tuberculosis in 7. A typical pneumonic onset was exhibited in 19, the disease pursuing the characteristic course of acute pneumonic phthisis in 12. Cardiac dilatation was occasionally observed, dyspnea from various causes not being infrequent.

As a result of this analysis, two central thoughts were suggested. (1) It appeared that attempted over-niceties of diagnosis sometimes resulted in the incorrect interpretation of physical signs, a judicious discrimination not always being in evidence as to the relative importance of the various features. In the commendable zeal for early diagnosis it seemed that a source of error was found in our enthusiasm to recognize somewhat obscure physical evidences of infrequent occurrence and doubtful import. (2) It was apparent that in advanced cases, faith in the efficacy of the home treatment and in the advantages of local institutions were responsible to a degree for the disastrous delay, and hence in some cases, for the unfortunate condition of those seeking climatic aid as a last resort.

Attention was further called to the increased frequency with which tuberculin was administered as a routine procedure irrespective of modifying conditions. A source of some surprise was the frequency with which the mercury treatment had been given. A stuffing process had been occasionally instituted, notwithstanding contraindications found in the digestion, circulation, or elimination.

A tendency was observed to minimize the importance of rest and to advocate less unreservedly the value to be derived from exercise not always within moderate bounds. Attention to the temperature and pulse apparently was not always a guide to the degree of physical exertion permitted.

There was convincing evidence to suggest that the necessity of strict obedience to hygienic precautions had been duly emphasized. Patients and accompanying members of the family were frequently found to have acquired a fund of knowledge as to the nature of the infection and the details of treatment. With many, particularly those of a judicial mind, the previous course of instruction was found to be of signal advantage. Others with unfortunate peculiarities of temperament and disposition were found altogether too familiar with the subject, in short, were over-educated to such an extent as to render them difficult of subsequent management. The resourceful control of the consumptive, which is a necessary preliminary to the control of the infection was not always easy, provided fixed ideas as to the value of remedial agents, and prejudices relative to various methods of procedure had previously been formed.

In view of these observations of a statistical and general character it has been of some interest to analyze my experience during the past year to ascertain if previous impressions are to be confirmed or modified.

During the twelve months ending November 1, 1910, 222 new patients having real or supposed tuberculous involvement have presented themselves for treatment, the large majority seeking medical counsel immediately upon arrival in Colorado. In addition there have been under supervision during the year, 80 who had been under previous observation, making a total of 302 consumptives furnishing material for further analysis. Of the 222 new patients, the physical and bacteriological findings were negative in 55. Several before arrival and subsequently responded positively to one of the integumental tests. A large proportion of these patients were influenced to leave home immediately upon the development of cough, elevation of temperature, slight loss of weight, general malaise or other suspicious symptoms, and in very many instances, even without the advice of a physician. Some presented the history of bronchitis of indefinite duration, asthma, emphysema, general debility, malaria, and neurasthenia. Symptoms suggestive of mixed infection were exhibited by 19 and corroborated by the bacteriological findings. Of these, 13 presented the history of one or more pulmonary hemorrhages, in none of which cases were tubercle bacilli discovered. The thought is conveyed that possibly hemoptysis among non-tuberculous invalids is more frequent than commonly supposed. Attention has previously been called to fairly numerous instances of pulmonary hemorrhage resulting from vicarious menstruation, purpura hemorrhagica, and circulatory

embarrassment incident to chronic bronchitis, emphysema and pneumoconiosis. Nearly all patients having one or more hemorrhages without definite evidences of tuberculous involvement presented the history of a sudden onset with chill, fever, cough, and expectoration. In a few cases the clinical course had been of so acute a type as to suggest the probability of an actual pneumonic process with a central or concealed area of involvement. In one or two cases a definite recognition of the pneumonic consolidation was obtained after arrival in Colorado.

Six patients were found to have developed tuberculosis in Colorado, 4 without apparent cause, 1 as a result of dissipation, and 1 following chronic bronchitis and pneumoconiosis.

Of the remaining 161 tuberculous patients coming during the year, the average period of delay before arrival was thirteen and one-half months, thus showing a gratifying change from previous years. More than 50 per cent. left home within six months after the onset of the disease. A large proportion of the balance had been to various health resorts for such prolonged periods as to increase the average delay for the entire number to thirteen and one-half months. It thus appears that the present tendency is for pulmonary invalids either to seek climatic relief or to avail themselves of institutional advantages somewhat earlier than in previous years. It is noted, however, that not infrequently early climatic change is found to have been directly opposed by attending physicians.

Thirty patients presented the history of a prolonged sojourn in institutions for consumptives. Of these 5 had exhibited satisfactory improvement, 4 had gained substantially and then relapsed, 2 exhibited no physical or bacteriological evidence of tuberculous infection, 1 of these having resided two years in a sanatorium, taking tuberculin during the entire period, and the other as often as every other day. Nineteen apparently failed to derive even temporary benefit and experienced as a result not only loss of time but of opportunity. Of these 1 had remained in an institution nineteen months, 1 two years, 2 had been in three sanatoria, and several in two. Of the thirty patients, 24 were far advanced, 2 incipient, and 2 without demonstrable tuberculous infection.

In the classification of patients, an effort has been made to conform strictly to the schema adopted by the The National Association for the Study and Prevention of Tuberculosis. In accordance with this grouping there were 27 incipient cases, 42 moderately advanced, and 92 far advanced. Attention has been called by writers to the enormous number of advanced consumptives sent to Western health resorts. It has been estimated that about 50 per cent. of the pulmonary invalids seeking climatic change are without the slightest possibility of cure in any region. This appears to be somewhat in line with my own observations, as of those with

demonstrable tuberculosis coming to Colorado during the past year nearly 56 per cent. were in very advanced stages, 26 per cent. moderately advanced, and but 16 per cent. truly incipient.

Further information is afforded by a study of the records with reference to the temperature, pulse, weight, and important complications. Of the 161 patients, statistical material is fairly complete in 150 cases. Of these, 108 exhibited a temperature of 100° or above at the time of arrival; 45, 101° or above; and 20, 102° or above. In 115 patients, the pulse was 100 or above, in 48, 110 or above, and in 37, 120 or above. The lack of correspondence between the physical signs and the pulse and temperature has been frequently noted. A number of patients classified as moderately advanced or far advanced have sometimes offered a relatively favorable prognosis upon the basis of but slight elevation of temperature, an excellent pulse, good appetite, and digestion. Others presenting the physical signs of incipient involvement have exhibited occasionally high fever, acceleration of pulse, nervous disturbances and important complications in addition to temperamental peculiarities and other conditions inimical to favorable results. The average loss of weight for the entire number before coming to Colorado was $20\frac{1}{2}$ pounds. The amount for the incipient class was $13\frac{1}{2}$ pounds, for the moderately advanced, 16 pounds, and for the far advanced, $24\frac{1}{2}$ pounds.

The following complications were observed: Tuberculous laryngitis in 20; tuberculous pharyngitis in 2; intestinal tuberculosis, not inclusive of fistula in 9; tuberculous peritonitis in 2; tuberculosis of the bladder in 2; tuberculosis of the kidney in 3; miliary tuberculosis of various types, 8; tuberculous glands, 1; perirectal abscess, 4; acute pneumonic phthisis, 5; pleurisy with effusion, 3; pneumothorax, 2; valvular cardiac lesions with varying degrees of compensation, 4; syphilis, 7; malaria, 5; diabetes, 2; advanced nephritis, 2; pregnancy at the time of arrival (far advanced case), 1. Albuminuria was noted in 61 patients. In many instances this consisted of a very slight trace sometimes undetected by the nitric acid test, but becoming definitely recognized by the heat test with acetic acid.

In attempting to estimate the results obtained among patients coming during the year, much difficulty is encountered by reason of the comparatively short period of observation, the extremely desperate condition and brief sojourn of a considerable number, the mixed character of the case, the differing circumstances, the not infrequent necessity of work, and for some the unavoidable absence of continuous supervision. Under these conditions it is possible only to form an approximate conclusion as to the degree and permanency of the benefits derived. In analyzing the results, however, a studious effort has been made to compile the statistics accurately.

It was not adjudged fair to include 35 patients remaining under observation but a very short time. Conforming strictly to the schema adopted by the The National Association for the Study and Prevention of Tuberculosis, it was found that of the remaining 126 irrespective of class, 29 did not improve, 30 improved, 34 were arrested, and 24 were apparently cured. None could be classed as actually cured on account of the shortness of time, two years without constitutional symptoms, physical or bacteriological evidences being required to permit inclusion in this classification.

Despite the diversified character of cases and the large predominance of those in far advanced stages, 77 per cent. have thus far exhibited degrees of improvement, nearly 35 per cent. being arrested cases, and nearly 20 per cent. apparently cured.

An analysis of results with reference to the several types shows that of the incipient cases, there were none who were not improved, 6 improved, 6 arrested, and 8 apparently cured. Of the moderately advanced, there were 4 unimproved, 5 improved, 13 arrested, and 11 apparently cured. Of the 3 classed as not improved, 2 had shown very pronounced gain in all respects until death resulted in one instance from aneurismal hemorrhage, and in the other from meningeal tuberculosis. The third was compelled to work daily in order to provide for the necessities of life for himself and family. Of the far advanced there were 26 unimproved, 19 improved, 24 arrested, 5 apparently cured, and 21 were either sent home or died very shortly after arrival.

Further information as to the progress made is acquired by a comparison of the gains established in body weight suggesting an increased resistance to the tuberculous infection. Of the far advanced cases who did not return home or succumb almost immediately, the average gain in weight was 9 pounds. Of those moderately advanced 14 pounds, only one in this group having failed to exhibit some improvement in this respect. Of the incipient cases, the average gain was 15 pounds.

Among 90 patients coming in previous years but remaining more or less under observation during the past twelve months, the results are grouped as follows: Not improved, 16; improved, 23; arrested, 32; apparently cured, 11; cured, 8. Of these the average gain in weight inclusive of those who did not survive, has been 16 pounds despite the fact that 8 failed to show any gain whatever. Of the 11 who died, 9 had gained materially in weight, as follows: 3, five pounds; 2, ten pounds; 2, thirty pounds; 1, twelve pounds; and 1, eight pounds.

Twenty-seven of the entire number observed during the year have died, a fatal termination being induced by exhaustion from advanced phthisis in 19, aneurismal hemorrhage (instantaneous) in 3, aspiration pneumonia following hemorrhage in 2, bronchopneumonia in 1, nephritis in 1, tuberculous meningitis in 1, intesti-

nal tuberculosis in 1, Schede operation in 1, pulmonary type of miliary tuberculosis in 3, and meningeal tuberculosis in 5.

The significance of the report as a whole is augmented by the fact that many were compelled to seek employment and were thus unable to conform to the régime in vogue in special institutions. Others were so handicapped financially as to preclude proper nourishment, and in some instances suitable accommodations.

A review of the foregoing statistical data serves but to accentuate previous impressions with reference to the early diagnosis and management of tuberculosis. From these studies, it seems reasonable to assume that while much has been accomplished in the past few years in the education of the public there is still something to be desired. It is to be expected that among different clinicians in varying localities, divergent views should be entertained according to the peculiarities of individual experience. In this instance, due significance must be attached to the number of persons sent away from home without positive evidence of tuberculosis, to the comparatively few early cases, the large proportion in moderately or far advanced stages, and the frequency of incurable complications. Opportunity has been permitted to note the disadvantages of routine tuberculin administration and the inevitable limitations of the sanatorium unless in a properly coördinated relation to other important measures of treatment. It is vitally important to recognize the value of a properly selected climate, the fundamental consideration being that of individual fitness. It is well known that notwithstanding a possible unhygienic environment and improper food and clothing, many incipient cases do recover at home, and that despite unfavorable climatic conditions, others somewhat more advanced, may exhibit periods of improvements while confined in closed sanatoria. While consumptives may recover in unsuitable regions, they are more likely to do so in localities wisely selected with reference to individual needs. In some instances, prompt recourse to a suitable climate represents the determining factor, but this is only capable of exerting its greatest influence when combined with a reasonable interpretation of modern hygienic and dietetic management. Experience has shown that many patients, who, through financial distress are deprived of the advantages of a supervisory régime, nevertheless are permitted to secure improvement amidst favorable climatic surroundings. To those compelled to work for a livelihood sojourn in a suitable locality may offer the only means of an eventual restoration of health. An arrest having been secured, a continued residence precludes in many instances, the relapse so common among individuals returning to their former occupations at home. In the interest of the consumptive class it is to be hoped that an increasing appreciation of the value of climate for properly selected cases may be justly entertained.

PERFORATION OF THE INTESTINES DUE TO TUBERCULOUS ULCERATION.

By John M. Cruice, A.B., M.D.,

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Although intestinal ulceration is of frequent occurrence in chronic pulmonary tuberculosis, perforation of the intestine rarely happens. Cornet,[1] in his article on tuberculosis, says: "Eichhorst, in 462 autopsies on cases of pulmonary phthisis, found intestinal ulcers in 29.9 per cent.; Heinze, in 1226 cases of consumption, 51 per cent. of tuberculous disease of the gut; Honing, in 70 per cent.; according to other authors, they occur in 90 per cent. (Wright, Orth); Baumgarten found them rarely absent; Herxheimer observed them in 57 out of 58 cases of phthisis." Fenwick[2] found the intestine the seat of ulceration 500 times in 883 cases, or in about 56 per cent. I found, in going over 475 autopsies at the Phipps Institute, that the intestines showed ulcers in 313 cases, or in 65.9 per cent.

The frequency of intestinal perforation is given at figures varying from 5 per cent. (Willigk[3]) to less than 1 per cent. Fenwick, in 2000 autopsies, found that perforation of the intestine had occurred as the result of tuberculous ulceration in 25 cases, about 1.2 per cent. Adami and McCrae[4] found perforation twice in 85 autopsies on chronic pulmonary tuberculosis, or a frequency of 2.35 per cent. In my 475 autopsies there were 13 instances of intestinal perforation, or 2.7 per cent.

Fenwick in his statistics takes into consideration only those cases that showed what he termed a "complete perforation." By that he means the ulcer had perforated directly into the peritoneal cavity and caused either acute peritonitis or a local abscess. He terms partial perforation those cases which, due to the local peritonitis from the ulceration, have formed adhesions with some other knuckle of gut before the ulcer has perforated. These cases do not cause acute general peritonitis, as the ulcer perforates on to the peritoneal covering of the section of gut to which it is adherent, and there is no extravasation of fecal matter into the general peritoneal cavity. Sometimes these cases ulcerate through the adherent portion of gut and form a fistula between the two segments of the intestine. Von Rindfleisch[5] reports an interesting case in which "five tuberculous ulcers of the ileum had perforated, not, however, into the peritoneal sack, but into divisions of the bowel,

[1] Nothnagel's Encyclopedia of Practical Medicine.
[2] The Dyspepsia of Phthisis. [3] Quoted from Fenwick.
[4] Proceedings of the Sixth International Congress on Tuberculosis, vol. i, part i, p. 330.
[5] Pathological Histology, New Sydenham Society's Transactions, p. 449.

which had previously become adherent opposite the seat of ulceration. This, of course, put a stop to all peristalsis, the products of digestion circulating without any order through numerous false passages in the abdominal cavity, inasmuch as the fistulous communications were in some cases wider than the caliber of the intestinal tube itself."

Following Fenwick's classification, of my 13 cases, 10 were complete perforations and 3 partial. Taking up, first, the complete perforations, 5 occurred in men and 5 in women, and the average age of the patients was thirty-two and one-half years. The small gut was the site of the perforation in 6 instances and the large one in 4. Of the 6 cases in the small gut, 5 are definitely stated to have occurred in the ileum, and in 1 case the notes do not specify whether the perforation was in the ileum or the jejunum. Two cases showed two complete perforations, and 1 case as many as four; in another the notes do not give the number, but state that "there were numerous perforations of typical tuberculous ulcerations." Acute peritonitis was present in 4 cases, and purulent peritonitis in 2.

Of the perforations occurring in the large gut, 3 were in the appendix and 1 in the head of the cecum. In one of the appendiceal cases the appendix had completely ulcerated off at the tip, and in another there was a perforation at the base of the viscus. The third case showed the appendix swollen near the tip and communicating with another mass to the left. Upon opening this mass purulent material was found and there was a perforation near the tip of the appendix.

Acute peritonitis was present in the perforation of the cecum and in the perforation at the base of the appendix. In the case where the tip of the appendix had completely ulcerated off there was purulent peritonitis. In the local abscess the peritoneum was normal.

The three partial perforations, those in which the perforation was walled off by adhesions, occurred in men, and the average age of the patients was forty years. The ileum was the seat of the disease in 2 instances and the transverse colon in 1. In the cases occurring in the ileum, one showed a single perforation and the other showed multiple perforations. The single perforation was 1.5 by 1.5 cm. in size, and in the multiple perforations one was 1 by 2 cm. In the perforation of the ileum the general peritoneum was normal; in the case with multiple perforations there was a general tuberculous peritonitis. The peritoneum, in the perforation of the transverse colon, showed only a localized peritonitis, the parietal layer of the peritoneum being apparently normal.

The clinical symptoms of perforations of the intestines in most conditions are usually distinctive and characteristic. There is first the sudden violent pain that occurs with the rupture of the bowel, said to be due to irritation of the nerves in the peritoneum.

The patient is in a condition of shock with pinched face, subnormal temperature, rapid running pulse, and often nausea and vomiting. At first the abdomen is rigid though it may be distended if gas has escaped into the free peritoneal cavity. Death may occur in a few hours, due to shock. If the patient survives the shock the symptoms of acute peritonitis develop. The temperature begins to rise, the pulse becomes more rapid, the abdomen, if not so before, becomes distended and painful. Nausea and usually intractable vomiting begin.

If such was always the picture in perforation of a tuberculous ulcer of the intestine the condition would not pass undiagnosticated so often. But it is a well-known fact that there can be advanced disease of the peritoneum in chronic tuberculosis without any marked symptoms or clinical signs.

Four of my cases of complete perforation had fairly typical symptoms and signs. Case No. 2360, a woman, aged thirty-three years, admitted to the wards on May 23, with no abdominal symptoms. On the thirtieth of the month she developed diarrhea. On June 13 she complained of marked pain in the abdomen. Abdomen was distended and quite rigid on the left side, and pressure in this area produced considerable pain. The temperature dropped to subnormal and the pulse went from 120 to 148. On June 14 the patient was in a state of collapse, with the abdomen greatly distended, tympanitic, hard, and painful. She had marked diarrhea. On June 15 her face was pinched, she was extremely weak, but had no pain, and the diarrhea had stopped. She died that evening. The autopsy showed a single perforation in the ileum and a purulent peritonitis. Case No. 2311, a man, aged twenty-four years, was admitted to the wards on April 23, complaining of diarrhea with cramps for three months. Abdomen was tense and painful and probably contained fluid. On April 30 he was seized with intense pain in the abdomen. The abdominal walls were hard and board-like. Temperature dropped from 101° F. to 95°, and the pulse went from 110 to 158. He died the next day, and the autopsy showed two perforations in the ileum and an acute peritonitis. Case No. 734, a woman, aged thirty-five years, was admitted to the wards with diarrhea. On February 16 her temperature became subnormal, her pulse much more rapid, and she lay in a stuporous half conscious condition. On February 20 her diarrhea stopped. A few days before her death her mind became clear. The autopsy on February 26 showed a perforated ulcer at the head of the cecum and an acute peritonitis. Case No. 4140, a woman, aged twenty-two years, admitted to the wards on May 14, with slight diarrhea, but no pain or tenderness in the abdomen and no rigidity. On May 21 she complained of pain in the abdomen; the next day the pain was very severe and accompanied by a slight fall of temperature but no change in the pulse rate, which was already

quite high. On May 29 she died, and the autopsy showed two perforated ulcers in the lower part of the ileum and an acute peritonitis.

The first two cases, particularly the first one, are typical case histories of perforation of the intestine, and with such data occurring in an advanced case of phthisis, a diagnosis of perforation of a tuberculous ulceration should be made. The last two are not so typical, but are suggestive enough to make one think of the possibility of perforation.

It is in the cases where the symptoms and signs are indefinite that autopsy findings are surprising. In 5 of my cases the symptoms were most indefinite. Two had absolutely no abdominal symptoms, 1 had pain in the abdomen but no other symptoms, 1 had pain, tenderness, and rigidity, with some slight change in temperature and pulse, and another showed only a drop in temperature. When it is remembered that all these signs and symptoms are found in a great number of cases which at autopsy only show ulceration of the intestine and perhaps some localized peritonitis, it is easy to realize how impossible it is to diagnosticate the condition in life.

The case of localized abscess had no diagnostic symptoms. There was diarrhea and some tenderness, but no mass was noted. Fenwick says that "a fecal abscess cannot be looked upon as a complication of chronic phthisis endowed with any symptoms more striking than those of chronic local peritonitis."

In the partial perforations the symptoms were no more than are found in a great number of chronic cases of phthisis. One had pain, tenderness, and the abdomen was tense and distended. Another complained of diarrhea and abdominal cramps, but had no tenderness and no rigidity. The third one had abdominal pain alone. I found in the analysis of the symptoms of the 462 cases who had no intestinal perforation that diarrhea was present in 49 per cent., tenderness in 22 per cent., pain in 20 per cent., and rigidity in 14 per cent. Hence, if all these symptoms occur in cases without perforation, how futile it is to try and diagnosticate a perforation from them alone.

CONCLUSIONS. 1. Perforation of the intestines in chronic pulmonary tuberculosis occurs in from 1 to 5 per cent. of cases.

2. It is possible to diagnosticate complete perforation in only a limited number of cases.

3. It is only possible to diagnosticate local abscess due to perforation when the mass can be felt.

4. It is never possible to diagnosticate with certainty a partial perforation.

PRENATAL AND INFANTILE TUBERCULAR PREDISPOSITIONS.

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All physicians are now familiar with what may be termed the technical prophylaxis of tuberculosis—how to deal with the tubercle bacillus and its bacterial congeners (which with it make up the mixed infections)—we know now thoroughly how to deal with the inhalation, ingestion, and inoculation types of infection in this disease. But there is a prophylaxis of tuberculosis predispositions at least as essential as that which is concerned with the specific cause; and this paper has to do with the prevention of such of these predispositions as may obtain up to the period which terminates infancy.

I am reminded of the Hibernianism of Oliver Wendell Holmes—that "a man should be careful in the selection of his ancestors." To fortify the organism with a view to enabling it to withstand infection, we must begin long before the birth of the individual concerned. In science, birth is but an incident in a succession of life processes; conception is but a transmutation of older cellular elements, such as are contained in the ovum and the sperm, into a new cellular compound. And it is after all with the quality and the virility of cells that we have primarily to deal. The practical deduction here is that those contemplating marriage who seek our advice, should be urged to proceed with the greatest circumspection and self-restraint, if they are conscious of any abnormal stigmata—any indications of degeneracy in themselves, either ancestral or acquired. Undoubtedly the possibility of parentage on the part of men and women who are unfit for this tremendous responsibility—the nearly related, couples of widely diverse ages, the neurotic, or pervert, or insane, the drug habitués, the syphilitic, the consumptive, and above all the alcoholic—the possibility of parentage among these should be precluded whenever this can possibly be done; generally speaking, all such subjects are likely to transmit to their offspring vitiated tissues, upon which the Koch bacillus and its bacterial allies may with unusual ease find implantation.

The principle of "natural selection" will, much more frequently than is assumed, act to prevent such marriages; this law of nature is infinitely more effective than any human legislation on the subject. However, when in these premises a physician is consulted, he should, as earnestly as may be, deprecate marriage; but emphatically should he countenance no marriage when tuberculosis

is active in either man or woman. Especially should no tuberculous woman be permitted to marry. In her case there is ever the possibility of death in childbirth, the probability—should that crisis be survived—of physical wreck and death by lingering stages subsequent to delivery. "Pregnancy is found to complicate, to precipitate, or to develop phthisis remarkably." And "when consumption is hanging about a girl, the distance between the marriage-bed and the grave is usually short with her; the husband if he does not become a widower soon after the birth of the first child may count upon a perpetually ailing wife." And, for the other side of the picture: "Many a young man has sacrified his chance of recovery on the altar of Hymen."

A consumptive should not marry a person in health, especially if the disease has existed a long time and is progressive; besides, a latent and comparatively innocuous lesion may through marital stresses develop an active and a fatal issue. But should one who has been consumptive, and who now does not evidence tuberculosis, marry? A patient who for two years has had no physical signs (except those of a healed lesion) and no other discoverable symptoms may be allowed to marry. Emphatically there should be no marriage while the disease is in progress; however, after there has been a relative recovery, when the symptoms have been in abeyance for two or three years, and a satisfactory general condition has been maintained, marriage need not be objected to (Cornet). If a man be financially fortified against the possibility of want or poverty, and if his wife makes no great or undue sexual demand upon him, he may be better off married than a bachelor—with all the unhappiness and discomfort contingent upon that unworthy and unfortunate state. On the other hand, a woman may be seriously harmed by marriage, with all its taxes upon the feminine organism. For wifehood, she should be strong and toned up beforehand, not only for her own sake but especially for that of her offspring. Conception must be advised against in consumptive women; they stand the puerperium badly. The disease often assumes its most acute form after childbirth, and then proves rapidly fatal. To save the maternal life interference may have to be counselled. Multiple births should be discouraged for such mothers.

Having thus dwelt upon the melancholy aspects of this question, its brighter side should receive due consideration. Although the observation generally holds good that tuberculous parents will have offspring with organisms prone to tuberculosis, there are many unquestionable cases, such as have been recorded by Flick, King, Cornet, and others, in which the offspring of consumptive parents have been found singularly immune to that disease. There are such marriages that have been blessed with perfectly strong and well-developed progeny. It would seem indeed, in such cases,

that the offspring is more immune to tuberculosis than infants not thus born. Possibly this is by reason of an acute exacerbation of tuberculosis in the mother, in which phase of the disease an immunizing antitoxin has been developed, and thus transmitted to the embryo in the maternal blood.

Though the marriages of consumptives are likely to be unfortunate, this does not always follow. A venerable gentleman once related to me how in his youth his mother had counselled him not to marry his beloved, who was consumptive. Nevertheless they did marry, and immediately after exchanged urban for country life. This was many years ago, when consumptives were put in superheated, malodorous, hermetically sealed rooms (so that no draught might assail them), and were made to swallow nauseating syrups until they died; before our profession was prescribing sunshine, fresh air, and good food in the treatment of tuberculosis. This courageous man went at once to the rural butcher and made arrangements for the best meats to be sent regularly to his house. Then he went to a vegetable farmer and asked him to name his price (that was no object; no matter what it was it would be paid) for the privilege he desired of going among those vegetables as often as he liked and of carrying off as much as he should wish to. And thus to others who had good nutriment to sell. And so this couple lived together, practising essentially the principles of therapy we now follow in tuberculosis; and the wife did not die of consumption, but achieved good health, and lived to bless that superb husband, through many years, to a fine old age.

When a consumptive has married, the pair should be counselled not to have intercourse in times of physical or psychic fatigue, or during such ill health as would intensify the original affection. When conception has occurred, we recall that during embryonic life the cells of the body become differentiated, and the organs are formed, increase in size, and begin to take on their several functions; that during this period the organism of the coming infant is most acutely sensitive to environmental impressions—such as variations in oxygen supply, warmth, and the constitution of the maternal blood. Before the birth, then, the mother should be safeguarded to the fullest possible extent, for the good of her offspring; she should, even more so than in ordinary pregnancies, be assured wholesome diet; sensible and hygienic clothing; should rest well at night, and for an hour after lunch; have frequent baths in tepid water, and the like familiar measures; especially should she be subjected to no unusual mental strain or excitement.

If, unfortunately, the child at birth exhibits stigmata, either functional or anatomical, we have to act without delay; and, of course, our therapy will here be a matter not of weeks or months, but of years. Here is the legitimate office of the family doctor; the specialist must be consulted from time to time, but the

family doctor, in his peculiarly intimate relationship, must have the medical bringing up of that child. Here he may have to deal with manifestations of the scrofulous temperament—the pallid skin and flabby flesh; tedious and subacute mucous membrane inflammations; enlargements of the lymph glands; unhealthy throats, bronchitis, gastrointestinal affections, sluggish metabolism. There may be strumous chest malformations; deficient ossification; stunted and weazened growth; breathing capacity below the average; defective circulatory development; perhaps an undersized heart and aorta, and anemia.

Rectification to the normal average may be impossible. Nevertheless, everything should be done to mitigate abnormal conditions as much as may be, not only for the sake of the child itself, but for the avoidance of baneful effects upon future generations. It is most encouraging to recall that functional aberrations from the normal, while more likely to be transmitted than anatomical stigmata, are, nevertheless, more amenable to treatment. Anatomical stigmata (if I understand the embryologists aright) are evolved out of functional stigmata. Although there may be no definite anatomical stigmata, a pernicious nutritive habit is often transmitted, which it is the business of the physician to detect and to cope with. Such patients, as intimated, will have to be kept under constant observation, not for weeks or months, but for years.

A weak and consumptive mother should not nurse her infant. There is little likelihood of her milk itself being infected (there is much more likelihood of the infant being infected by the mother's cough, as it lies upon the breast). But the milk of such a mother is not, in general, sufficiently nutritious; besides, lactation is a great drain upon her already depleted strength, and may precipitate a fatal termination, and that before the time when such breasts are naturally dry. Either a wet-nurse should be found or the infant should be bottle-fed. The latter is now the better way, in view of the profession's remarkable advances in infant feeding. In large cities, both public and private charities have become so beneficently active in this regard that the poorest people may have excellent milk, properly modified, at little cost, or, if need be, at no cost at all. Especially is it fortunate, I believe, that municipalities are now in general committed to pasteurization. While ingestion infection is perhaps infrequent among adults, I have for my part never made any doubt of the deplorable frequency in infants and children of latent tuberculosis by reason of the bovine tubercle bacillus in milk.

The separation of an infant from a tuberculous mother is a matter not easy of adjustment or decision. Certainly, there is little occasion if the mother be conscientious and properly instructed and if the infant be bottle-fed. The maternal impulses should receive much consideration. Such separation is often

impracticable among the poor. In many cases among the poor it were well if the mother would have her child taken care of for part of the day in a general nursery, such as the charitable provide in cities. Many poor people cannot be without their children; many are not willing to be; separation should not be, nor can it be, compelled. In any event, the infant's home should be made free of infection by and thorough and frequent purification and by disinfection occasionally. The floors should be particularly clean, and carpetless if possible, rugs (which may be frequently renovated) being substituted. The infants should be properly clothed and bathed. Dr. Abraham Jacobi has made notable observations on the hardening of the infant. Adenoids and hypertrophied tonsils should be removed, or at least treated. The child must not be starved for oxygen. Sleeping children should have plenty of air; sleeping garments of the grain-bag construction should be provided them. All respiratory and circulatory affections should receive unremitting attention. Convalescents from diphtheria, pertussis, measles, scarlet fever, and so forth, should be carefully nurtured, and, if possible, sent into rural districts. Headaches, purulent otitis medias, and abdominal symptoms should be promptly attended to, as also accidents and, very imperatively, injuries involving bones and joints. Most of these lesions in infants and young children are or become tuberculous. All young structures are less firm, less organized, and more vulnerable than those of the adult. The child should as early as possible be taught not to swallow its sputum or the excretions from its upper air passages; these are frequently bacillus-laden, and may engender intestinal tuberculosis.

THE LEUKOCYTIC PICTURE IN PULMONARY TUBERCULOSIS.[1]

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In order to determine whether in pulmonary tuberculosis any relationship exists between the different types of leukocytes and the extent and progress of the disease, we have made 182 differential

[1] Read before the Philadelphia County Medical Society, October 26, 1910.

blood counts on 50 tuberculous patients. The latter were under the care of one of us in the Home for Consumptives, Chestnut Hill, and in the Philadelphia Jewish Sanatorium for Consumptives, Eaglesville, situated 500 and 600 feet, respectively, above sea level. The one who made most of the counts knew nothing about the condition or progress of the patients. The number of blood counts in the individual cases varied from one to nine. The blood was stained with eosin and hematoxylin.

We classify the white cells as polymorphonuclear neutrophiles, which are subdivided according to the number of nuclei they contain, lymphocytes, mononuclear cells, transitional cells, polymorphonuclear basophiles, and eosinophiles. Of the mononuclear basophilic cells, we designate as lymphocytes those in which the nucleus occupies more than half of the cell, and as mononuclears those in which the protoplasm equals or exceeds the nucleus in size. We regard such a classification as more rational and less liable to personal error than one in which the cells are differentiated by their size.

The patients are grouped in three stages, as incipient, moderately advanced, and far advanced, and as apparently cured, arrested, and improved cases, according to the schema of the National Association for the Study and Prevention of Tuberculosis, and, in addition, as stationary and advancing cases. They are also classified according to the extent of the disease in the lung, as recommended by Turban. Patients in the third, or far advanced, stage we further subdivide into those capable of working and those incapacitated, the latter being again subdivided into those that are toxic and those that are not.

The following tables give the average proportion of each type of cell we found in the different groups, and the number of cases and blood counts on which the averages are based:

	No. of cases.	No. of blood counts	Polymorphonuclears.	Lymphocytes.	Mononuclears.	Transitionals.	Eosinophiles.	Arneth I and II.
All stages	50	182	66.0	30.0	1.5	1.0	1.5	44.5
Stage I (incipient)	13	46	62.5	33.5	2.0	0.5	1.5	44.5
Stage II (moderately advanced)	6	27	65.0	30.5	2.0	1.0	1.5	41.5
Stage III (far advanced)	31	109	68.0	28.5	1.5	1.0	1.0	44.5
Class I (Turban)	14	50	63.0	33.0	2.0	1.0	1.0	45.5
Class II (Turban)	9	36	65.5	30.0	2.0	1.0	1.5	45.0
Class III (Turban)	27	96	68.0	28.5	1.5	1.0	1.0	43.5
Apparently cured	5	24	61.0	35.0	2.0	0.5	1.5	43.0
Arrested	5	16	64.5	30.5	2.5	1.0	1.5	47.5
Improving	15	68	64.5	31.5	2.0	0.5	1.5	44.0
Stationary	9	30	69.0	28.5	1.0	0.5	1.0	32.0
Advancing	15	43	68.5	27.0	1.5	1.5	1.5	45.0

In the following table the patients in each stage have been grouped according to the progress of the disease:

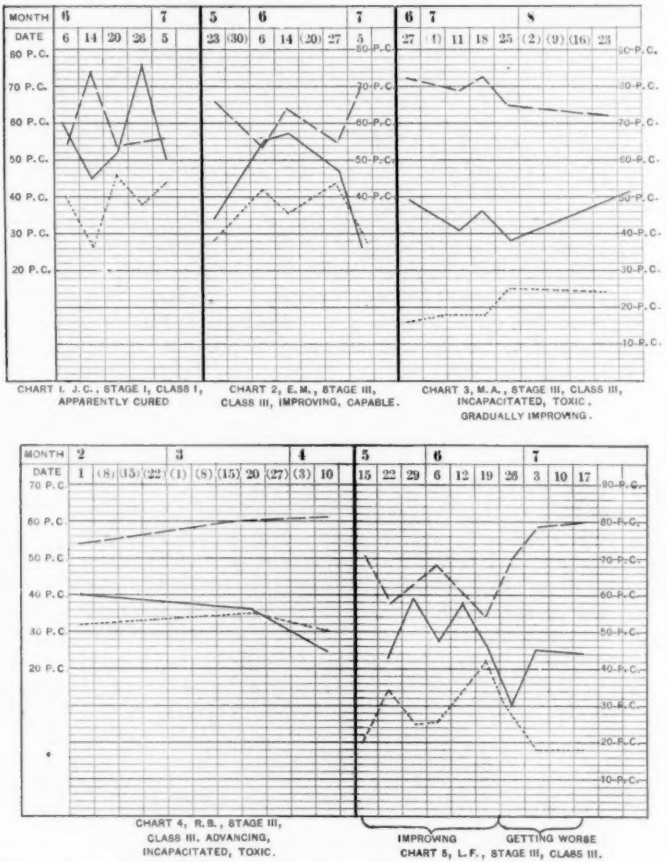
	No. of cases.	No. of blood counts.	Polymorphonuclears.	Lymphocytes.	Mononuclears.	Transitionals.	Eosinophiles.	Arneth I and II.
Stage I:								
Apparently cured	5	24	61.0	35.0	2.0	0.5	1.5	43.0
Arrested	3	6	66.5	29.0	2.5	1.0	1.0	52.0
Improving	5	16	62.0	34.5	1.5	1.0	1.0	42.0
Stage II:								
Arrested	2	10	61.5	33.0	2.0	1.5	2.0	40.5
Improving	2	13	66.5	28.0	3.0	0.5	2.0	49.0
Stationary	2	4	67.0	30.5	1.0	1.0	0.5	69.0
Stage III:								
Improving	8	39	65.8	30.4	2.0	0.4	1.4	46.7
Stationary	8	27	68.5	29.0	1.0	1.0	0.5	43.0
Advancing	15	43	68.5	27.0	1.5	1.5	1.5	45.5
Capable of working	9	37	64.5	32.0	2.0	0.5	1.0	43.0
Incapacitated	22	72	69.5	27.0	1.5	1.0	1.0	45.5
Non-toxic	8	35	68.0	29.0	1.0	1.0	1.0	46.5
Toxic	13	33	70.0	26.0	1.5	1.5	1.0	45.0

Polymorphonuclear Neutrophiles. A regular increase in the proportion of polymorphonuclear cells was observed with the advance in the stage of the disease and in the amount of lung involvement. This agrees with the results of Holmes,[2] Hultgen,[3] Swan,[4] and Craig.[5] We also found a smaller percentage of polynuclear cells in patients who were doing well, and a larger percentage in those doing poorly. It seems to us that the blood picture is influenced more by the progress of the disease and the patient's resistance than by the stage or extent of the process. The average pictures obtained in each stage we therefore attributed in large measure to the condition exhibited by the majority of the patients in that stage. That it is the condition of the patient that is responsible for the blood picture rather than the stage or the extent of the disease, is brought out particularly well in our minuter subdivisions of Group III.

Webb and Williams[6] found the smallest number of polynuclear cells in normal cases, the next highest in order being cured, improving, stationary, and advancing cases. The experiences of Pavillard,[7] d'Oelsnitz,[8] and Arloing and Gentry[9] were practically similar.

[2] New York Med. Rec., 1896, l, 325.
[3] Trans. Chicago Path. Soc., 1909, vii, 199.
[4] Jour. Amer. Med. Assoc., 1904, xlii, 697.
[5] Fourth Annual Report of Henry Phipps Institute, Philadelphia, 1908, p. 108.
[6] Trans. Nat. Assoc. for the Study and Prevention of Tuberculosis, Philadelphia, 1909, p. 231.
[7] Thèse de Paris, 1900.
[8] Ibid., 1903.
[9] Lyon Méd., 1910, cxiv, 966.

Since we read our paper, Wright and King,[10] Dominguez,[11] and Miller and Reed[12] have also reported practically similar results. Sondern[13] regards an increase in the relative number of polynuclear cells as a direct indication of the severity of the toxemia. Bezançon, de Jong and de Serbonnes[14] always observed a moderate transitory increase in the polynuclear cells just at the beginning of what they


MONTH
DATE
80 P.C.
70 P.C.
60 P.C.
50 P.C.
40 P.C.
30 P.C.
20 P.C.
CHART 1. J.C., STAGE I, CLASS I, APPARENTLY CURED
CHART 2, E.M., STAGE III, CLASS III, IMPROVING, CAPABLE.
CHART 3, M.A., STAGE III, CLASS III, INCAPACITATED, TOXIC. GRADUALLY IMPROVING.
CHART 4, R.S., STAGE III, CLASS III, ADVANCING, INCAPACITATED, TOXIC.
IMPROVING
GETTING WORSE
CHART 5, L.F., STAGE III, CLASS III.

The broken line indicates the percentage of polymorphonuclear cells, the continuous line the percentage of polymorphonuclear cells with one and two nuclei, and the dotted line the percentage of lymphocytes.

[10] Amer. Jour. Med. Sci., 1911, cxli, 852.
[11] Sanidad y Beneficencia, Havana. 1911, v, 449.
[12] Jour. Amer. Med. Assoc., 1911, lvii, 504.
[13] Boston Med. and Surg. Jour., 1905, cliii, 690.
[14] Arch. de Méd. expér. et d'anat. path., 1910, xxii, 17.

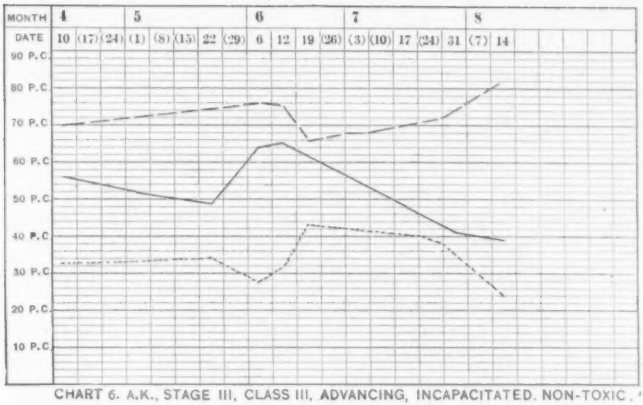


CHART 6. A.K., STAGE III, CLASS III, ADVANCING, INCAPACITATED, NON-TOXIC.

No counts were made on the dates in parentheses. The lines have the same significance as in the preceding charts.

term an evolutive progression or exacerbation, and a marked increase in galloping consumption and in grave forms of the disease.

Arneth's Classification of Neutrophiles. The neutrophilic cells were divided in accordance with the number of nuclei they contained, as first practised by Arneth.[15] In the tables are recorded the percentage of neutrophilic cells with one and two nuclei, which many take as an index, 45 to 55 per cent. of these cells being regarded as normal. The average index we obtained in each group was practically normal. While the average index showed little change, in most of our individual cases the proportion of cells in the first two classes of Arneth seemed to be increased as the patient improved, and in a number of cases to be diminished as the patient grew worse. In many instances the rise would be maintained only for several weeks. Of 27 improving patients, whose blood was examined more than once, an increase in cells with one and two nuclei was observed in 22, and a decrease in 4. Among advancing cases there was an increase in 3, a decrease in 4, and no change in 2. The blood charts of several cases are given, showing this change.

Our figures are opposed to those of all other workers. Arneth, Achard,[16] Arloing and Gentry, Bushnell and Treuholtz,[17] Dluski and Rospedzihowski,[18] Edson,[19] Klebs and Klebs,[20] Minor and

[15] Die Neutrophilen weissen Blut Korperchen bei infections Krankheiten. Gustav Fischer, Jena, 1904.

[16] Semaine Méd., xxix, 517.

[17] Med. Record, 1908, lxxiii, I, 470.

[18] Proc. of Sixth Internat. Cong. on Tuberculosis, Philadelphia, 1908, i, 1143; Beiträge zur Klinik der Tuberculose. Würtzberg, 1909, xiv, 259.

[19] Trans. Amer. Climat. Assoc., 1909, xxv, 52.

[20] Amer. Jour. Med. Sci., 1906, cxxxii, N. S., 538.

Ringer,[21] Webb and Williams,[22] von Borsdorff,[23] Wolff,[24] and Sabrazès[25] state that in favorable and improving cases there is a decrease, and in unfavorable cases an increase, in the number of neutrophilic cells with one and two nuclei, at the expense of those with three, four, and five nuclei, the increase being greater the more severe the case. This was also the experience of Miller and Reed.

Whether altitude has any effect on Arneth's index cannot be deduced from the articles quoted, as the authors fail to give the altitudes of the sanatoria where they were working. It might be mentioned in passing that Minor and Ringer count nuclei connected by a distinct isthmus as one nucleus; that all the cases quoted by Bushnell and Truholtz do not bear out their statements; that of Webb and Williams' figures, which give only the maximum and minimum, the latter does not agree at all closely with Arneth; and that the average normal index is 48.5, according to Minor and Ringer, and 65, according to Webb and Williams.

Lymphocytes. In our cases the average proportion of lymphocytes was less the more advanced the stage of the disease, the greater the amount of lung tissue involved, and the more unfavorable the condition of the patient. There is but one exception to this, arrested cases holding a position between improving and stationary caes. On subdividing Stages I and II, according to the patient's condition, more exceptions to this rule are observed, due possibly to the small number of cases in each subgroup. In the third stage, however, which numbers more cases, the regular diminution in the lymphocytes in the more advanced cases is beautifully shown.

Additional evidence that the blood picture represents the resistive power of the patient, rather than a certain stage of the disease, is furnished when the patients in the third stage are subdivided into those capable of working and those incapacitated.

In the individual patient the proportion of lymphocytes was seen to increase as the patient improved and to diminish as he grew worse. Of 40 patients who were examined more than once, changes in the proportion of lymphocytes occurred in 32; 27 patients improved while under observation, 17 of these showing an increase in the proportion of lymphocytes, 8 a decrease, and 2 no decided change. Among 9 patients that grew worse while under observation, the lymphocytes were increased in 1, diminished in 6, and unchanged in 2. Of 4 patients whose condition remained stationary while under observation, the lymphocytes were increased in 1 and diminished in 3.

[21] Trans. Amer. Climat. Assoc., 1909, xxv, 37; AMER. JOUR. MED. SCI., 1911, cxli, 638.
[22] Personal communication to Minor and Ringer; Colorado Med., 1911, viii, 175.
[23] Folia hæmatol, i; Archiv., 1910, ix, 242.
[24] Die Kernzahl der Neutrophilen, Heidelberg, 1906, Carl Winter.
[25] Arch. d. mal. du cœur, 1910, iii, 484.

A decrease in the proportion of lymphocytes as the disease becomes more advanced was also observed by Craig, Hultgen, and Strauss and Rohnstein.[26] Miller and Reed's observations were also similar. Cabot[27] states that an increase in lymphocytes is not peculiar to tuberculosis, but occurs in a variety of debilitated conditions. Holmes says that as the tuberculous condition becomes less marked and convalescence increases, the percentage of lymphocytes increases. Webb and Williams found the proportion of lymphocytes highest in normal persons, and then gradually lower in cured, improving, stationary, and advancing cases, respectively. Arloing and Gentry noted that an increase in mononuclear cells occurred in favorable forms of the disease. According to Bezançon, de Jong and de Serbonnes, in each progression the first stage of polynuclear increase is succeeded by a second stage of increased mononuclear cells. Richard's[28] forms of resistance to tuberculosis of attenuated virulence they found characterized by a sufficiently pronounced increase in lymphocytes. They state that the establishment of an increased proportion of mononuclears indicates in a general way a tendency to improvement. (This last statement has been confirmed by Wright and King and by Miller and Reed. Dominguez states that tuberculosis of medium virulence is distinguished by a marked lymphocytosis without evident mononucleosis. He also finds a lymphocytosis in laryngopulmonary tuberculosis and in bronchopneumonic tuberculosis.)

Mononuclears and Transitional Cells. The mononuclear and transitional cells in our cases show practically no changes with the advance of the disease, as indicated by the process in the lung, or by the patient's condition. (This was also the experience of Wright and King.) Craig, who obtained a much larger proportion of transitional cells than we did, found the smallest percentage in cases belonging to the second stage, and the largest in those belonging to the third stage of the disease.

Eosinophiles. The percentage of eosinophiles in our cases was unaffected by the stage or extent of the disease or by the condition of the patient. (Wright and King are in agreement with us upon this point.) Hultgen, Webb and Williams, Swan, Swan and Karsner,[29] d'Oelsnitz, and Bezançon, de Jong and de Serbonnes, however, found that the proportion of eosinophiles diminishes as the patients grow worse and increases as they improve. This latter fact was also observed by Arloing and Gentry and Wile.[30] (Dominguez and Miller and Reed also observed this latter fact.)

According to Bezançon, de Jong and de Serbonnes, at the

[26] Die Blutzusammensetzung bei den verschiedenen Anamieen, Berlin, 1901, Hirschwald, p. 74
[27] Clinical Examination of the Blood, fifth edition, New York, 1904, Wm. Wood & Co., p. 296.
[28] Quoted by Bezançon, de Jong, de Serbonnes, Province Médicale, 2 Mai, 1908.
[29] New York Med. Jour., 1907, lxxxv, 539.
[30] New York State Jour. Med., 1910, x, 205.

height of the second stage of the progression the number of eosinophiles commences to rise, this terminal eosinophilia seeming to these authors the most fundamental characteristic of the evolutive tuberculous progression, being maintained long after the clinical symptoms are improved. In a careful study of many cases, some over long periods of time, we were unable to confirm these observations.

No one has as yet given the eosinophilic picture obtained in tuberculosis according to Arneth's[31] method of subdividing the eosinophile cells into four classes, based upon the number of nuclei they contain.

CONCLUSIONS. 1. Improvement in pulmonary tuberculosis is associated with an increase in the proportion of lymphocytes in the blood at the expense of the polymorphonuclear cells. As the patients grow worse the proportion of polynuclear cells increases at the expense of the lymphocytes. None of the other types of white cells are affected by either condition. As a consequence, the percentage of lymphocytes will usually be less and the percentage of polynuclears will be greater, the more advanced the disease and the greater the amount of lung tissue involved.

2. As a patient begins to improve there is usually an increase in the proportion of polynuclear cells containing one and two nuclei, the increase often being maintained for several weeks, but not indefinitely.

3. Mononuclear, transitional, and eosinophile cells are unaffected by the stage, extent, or progress of the disease.

4. The leukocytic picture in pulmonary tuberculosis corresponds with the patient's resistance to the disease rather than with the extent of the lesion.

5. By means of the leukocytic picture it is often possible to determine the resistive power of a tuberculous patient and to form a fairly accurate estimate of the chances for recovery.

THE NORMAL DIFFERENTIAL LEUKOCYTE COUNT.

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WHEN one endeavors to interpret the blood picture of a disease, it is obvious that he must know the normal differential leukocyte count. I have always accepted the Ehrlich percentages as commonly taught, but recently, in checking the results of a study of

[31] Deut. Arch. f. klin. Med., 1910, xcix, 19.

the blood in Hodgkin's disease, I was led to make a few differential counts on people who were, to all appearances, normal and in good health. These counts were at variance in some respects with the ordinarily accepted leukocyte picture, and in consequence I extended my series to counts on 25 persons, in order to be certain that in my first few counts I was not dealing with individuals whose blood happened to have the same peculiarities. The results of these 25 counts are still at variance with the text-book picture, and while the series is perhaps not extensive enough to overthrow that picture, yet the results as set down may be accepted as an accurate representation of the blood of individuals for the age indicated.

In glancing over the counts given in the various text-books on clinical microscopy and clinical medicine, one finds that there is considerable variation in them, and further that there is an entire absence of data as to the number or age of the individuals upon whom the counts are based. The following percentages have been gleaned from the text-books readily at hand, the leukocytes being divided into five or six classes, according to the working classification of Ehrlich: Polymorphonuclear neutrophiles (N.); eosinophiles (E); basophiles (Mastzellen) (B); small mononuclears (lymphocytes) (S. M.); large mononuclears (L. M.), usually including transitionals (Tr.).

Author.	N.	E.	B.	S. M.	L. M.	Tr.
Ehrlich and Lazarus (in Nothnagel)	70–72	2–4	0.5	22–25	1	2–4
Simon	60–70	1–4	0.2–1.0	20–30	1–6	
Cabot (in Osler)	60–70	0.5–3 or 4	0.1–0.5	20–40 of which	1–10	
Da Costa	60–75	0.5–5	0.5	20–30	4–8	
Stengel	65–70	3 or less	...	25	3–6	
Rotch	60–75	1–2	...	24–30	3–6	
Drysdale (in Allbutt)	66	1–3	0.5	25–26	2–4	
Krehl	70	1–4	0.5–2	25–28 of which	2–4	
Taylor	55–80	½–8	rarely seen	10–40	1–8	
Coles	70–75	...	...	15–20	6–8	
Von Limbeck	70–80	0.67–11				

Both Emerson and Sahli follow the figures of Ehrlich and Lazarus, accepting the rather narrow limits of variation in the neutrophile and lymphocyte percentages.

The counts presented below were made upon medical students and laboratory assistants, 23 of whom were men, and 2 women. With one exception they were in the first half of the third decade of life. The one exception was just above the age of thirty.

They were all in daily attendance upon university work, all apparently in health, and none conscious of any illness. Several of them were athletes in training. While the majority of the counts were made in the spring months, the rest were sufficiently scattered throughout the year to seem to indicate that season was not a factor. As a rule, though not invariably, the counts were made just before the noon hour

The blood smears have been stained with Wright's stain, and upon the basis of this stain I have divided the leukocytes into seven

classes, following the Ehrlich classification, with the exception that I have divided the lymphocyte group into large and small types. While the division of the so-called non-granular cells (on an Ehrlich stain basis) into four groups is somewhat arbitrary, and while one is sometimes in doubt just where to place certain individual cells, yet four distinct types of cells can be made out. These may be briefly described as follows:

1. *Small Lymphocyte.* A cell with deeply staining nucleus which scarcely exceeds a red blood cell in diameter, and with a scant rim of basophilic protoplasm.

2. *Large Lymphocyte.* A cell usually almost the size of a neutrophilic leukocyte, with nucleus larger than that of the preceding class, and with protoplasm more abundant, less basophilic as a rule, and containing numerous coarse almost rod-like metachromatic granules.

3. *Large Mononuclear.* A cell larger than a neutrophilic leukocyte, with a large round or oval nucleus and considerable protoplasm staining a fairly deep blue and containing at times a few fine metachromatic granules.

4. *Transitionals.* The largest cells of the group, with nuclei of a variety of shapes, from simply indented forms to lobed, mulberry-shaped or even ring-shaped nuclei, and with abundant, clear, light-blue protoplasm thickly dotted with fine metachromatic granules which do not stain with Ehrlich's triple stain.

Upon this basis the following differential counts have been made, and they have been arranged according to the percentage of neutrophiles:

No.	Total count.	N.	E.	B.	S. L.	L. L.	L. M.	Tr.
1	9,000	68.6	2.2	0.2	14.6	5.2	2.0	7.2
2	7,600	64.4	3.4	0.0	15.4	8.6	1.4	6.8
3	6,800	62.6	0.8	0.8	18.6	9.0	1.8	6.4
4	12,000[1]	61.8	0.8	0.4	21.2	8.8	0.6	6.4
5	7,000	61.6	1.8	1.0	21.4	6.8	0.6	6.8
6	6,700	60.6	5.6	0.6	19.4	4.6	1.6	7.6
7	12,200[1]	58.8	3.8	0.6	28.0	7.2	0.8	8.8
8	8,800	58.2	4.0	1.2	21.0	8.6	0.6	6.4
9	6,700	57.2	2.4	0.0	21.2	7.6	1.8	9.8
10	8,000	57.2	2.0	0.6	24.0	6.4	1.0	8.8
11	7,000	56.8	3.6	0.4	17.8	11.4	2.4	7.6
12	6,000	56.8	1.8	1.8	20.2	10.8	2.0	6.6
13	6,800	55.2	3.6	0.8	20.4	10.0	1.2	8.8
14	9,600	55.2	3.0	1.0	34.0	3.2	0.4	3.2
15	7,000	55.0	2.2	0.6	28.0	7.2	0 8	6.2
16	6,300	53.8	1.0	0.6	25.2	11.0	1.0	7.4
17	7,000	53.0	1.6	1.2	27.4	5.6	1.2	10.0
18	6,300	52.2	0.8	0.6	20.2	16.0	3.4	6.8
19	5,700	51.6	2.4	0.4	33.2	3.8	1.0	7.6
20	8,500	51.0	2.6	1.6	20.6	16.0	2.2	6.0
21	7,500	50.8	6.8	1.4	19.4	11.0	2.8	7.8
22	5,900	45.6	4.2	1.0	35.2	4.8	0.8	8.4
23	7,000	42.8	3.2	1.2	25.0	13.2	3.6	11.0
24	8,900	38.0	6.2	1.2	27.6	17.8	3.0	6.2
25	5,000	37.4	9.6	0.6	24.8	16.2	3.8	7.6

[1] Verified at a subsequent date.

To summarize the counts briefly, one finds that the average of the total counts is 7,580, while 60 per cent. of the cases lie between 6000 and 8000, with a minimum of 5000 and a maximum of 12,000. Of the neutrophiles, 60 per cent. of the counts lie between 50 and 60 per cent., with the remaining 40 per cent. almost equally divided between those above 60 per cent. and those below 50 per cent. The average of the counts is 54.6 per cent. Further, 60 per cent. of the small mononuclears lie between 30 and 40 per cent., with 30 per cent. of the counts below 30 per cent. and but 10 per cent. above 40 per cent. The average is 33.1 per cent. The eosinophiles range from 0.8 to 9.6 per cent., with an average of 3.2 per cent., with 25 per cent. of the counts below 2 per cent., 25 per cent. between 2 and 3 per cent., 25 per cent. between 3 and 4 per cent., and the other quarter above 4 per cent. Basophiles range from "none seen in counting 500 cells" to 1.8 per cent.; the average being 0.8 per cent., and 40 per cent. of counts showing more than 1 per cent. The large mononuclears vary from 0.4 to 3.6 per cent., with an average of 1.6 per cent. The transitionals are about the most constant in percentage, 66 per cent. of the counts lying between 6 and 8 per cent., with but one count below 6 per cent., and but three above 9 per cent., the average being 7.4 per cent.

From this summary we may construct our probable limits for the percentages and our average count as follows:

	Total	N.	E.	B.	S. L. L. L.	L. M.	Tr.
		%	%	%	%	%	%
Probable limits	6000–8000	50–60	0.8–4.0	0.4–1.8	30–40	0.6–2.0	6–8
Average . .	7500	54.6	3.2	0.8	33.1	1.6	7.4

The points of difference between these counts and those cited earlier from the text-books are almost too obvious to mention. Briefly, however, no neutrophile count of the series is as high as the Ehrlich minimum, and 80 per cent. of the counts are lower than the minimum accepted by the majority of authors. On the other hand, the lymphocytes are above the maximum of the majority of the text-book counts, and the transitionals also are on the upper margin of the accepted normal. The other elements do not vary much from the usual figures.

It has puzzled me to explain these differences. While there are several possible explanations, the most probable seemed to be that the use of the Wright stain instead of the Ehrlich triple stain was largely responsible. In anything except a perfect Ehrlich stain the cells of the non-granular group are often so pale as to be easily overlooked, while with the methylene-blue-eosine stains both granular and non-granular cells are equally prominent. Comparative counts in my hands, however, showed no such difference, possibly because my attention was focussed particularly upon the mononuclear cells in the Ehrlich count. Another possibility is that

the lymphoid activity of adolescence may persist well into the third decade, so that one cannot expect the adult leukocytic formula until a later age. A few counts upon persons in the fourth decade not included in the list above do not bear out this assumption. It seems possible that the climate of Wisconsin in favoring chronic catarrhal conditions of the respiratory tract might be a factor. One might then expect a seasonal variation in the count, which was not found. Whatever may be the explanation, I am convinced of the accuracy of these counts for the age and the locality in which they were made, and feel that they must be taken into account in interpreting the blood picture of diseases common in the third decade.

STUDIES OF THE BLOOD IN DISEASE COMMONLY CALLED NERVOUS DISEASE.[1]

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AND

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There are few diseases of the nervous system that flow directly out of disorders of the blood. It is not the purpose of this communication to discuss such disorders. There are certain symptoms popularly called "nervous" which are dependent upon hemic states, and there are diseases of the viscera and of the blood that masquerade as affections of the nervous system. Such cases come to the neurologist in much greater number than the internist can readily believe. One of the objects of this paper is to emphasize the role that hematology plays in the pathogenesis of certain neurotic conditions. Before the establishment of the Neurological Institute we were not in a position to estimate either the frequency of occurrence of such disorders of the blood, or the diagnostic value that might be attached to them. We have been made aware that blood changes need not necessarily be pronounced in order to constitute a deviation from the normal. The trained eye readily sees changes in the various components of the blood, primary or secondary, which easily escape the eye that is not daily made familiar with slight deviations from the normal. Naturally we do not contend that there is a hematology for nervous diseases alone. We wish to maintain that the study of the blood in cases that present themselves for interpretation to the neurologist is

[1] Read before the Association of American Physicians, May 10, 1911.

one of the most fruitful fields for investigation. We are already in possession of a distinctive hematological picture in cases of paralysis dependent upon lead poisoning (lead neuritis, lead myositis), and plumbism may be diagnosticated as readily from examination of the blood as can malaria.

We are still far from a satisfactory understanding of the pathogenesis of the degenerations of the spinal cord and brain that flow apparently from certain anemias, and one of the problems of hematology is to determine the specificity of the anemias that produce such degenerations.

We propose to cite briefly a few cases which came to the Neurological Institute for interpretation and point out the importance that the study of blood conditions had in leading us to the correct diagnosis.

PROFOUND EOSINOPHILIA IN A CASE OF PITUITARY AND MEDIASTINAL TUMOR.

CASE I.—A Jewess, aged thirty years, came September 12, 1910, complaining of pain in the right arm and in the back. This pain was of a sharp, shooting character, worse at night and rather paroxysmal in display; although she had some pain all the time, it was far worse at one time than it was at another. In addition to this, she complained of frontal headaches, which had been in existence for three weeks, of amenorrhea of six years' duration, and of loss of sight of the right eye. Her personal history could scarcely be construed to have any bearing upon her illness, which began three weeks before she presented herself at the hospital. It may be of interest, however, to know that she married at twenty-three, and soon after her menstruation, which had been previously regular, ceased. She had never been pregnant. She weighed 120 pounds when she married, and each succeeding year she gained about 10 pounds. The illness for which she sought relief began August 20, 1910, three weeks before she came to the hospital. The initial symptom was pain in the chest on the right side, then shortness of breath, which increased in intensity from day to day. She saw several physicians, but secured no relief. She had forgotten she had an attack of diplopia eighteen months before. It was not until August 25, 1910, she said, that her eyes began to bother her; objects were then blurred when she read or sewed; wearing of glasses produced no change; later she began to see double. Careful inquiry showed that in June, 1910, she had remarked that she could not see with the right eye. She was advised to consult a neurologist, who told the patient's husband that her brain was affected. She says, however, that until August 20 she was in the best of health, only experiencing some difficulty in breathing while ascending stairs.

At this time she was returning from Brooklyn, and at the Brooklyn Bridge was seized with a sick, dizzy, faint feeling. The neurologist who had diagnosticated the brain condition, advised cold compresses to the chest. During the next few days she began to feel feverish and to have chills and pains in the chest and back. It was then said she had pleurisy. She grew rapidly worse, very weak and nervous, restless and sleepless. The condition of restlessness and sleeplessness was ascribed to the ovarian extract which had been prescribed for her. About this time it was noticed that her face was puffed and swollen, and that she had considerable dyspnea. On September 14, 1910, when she entered the Neurological Institute, the following notes were made:

The patient in a semirecumbent position has labored breathing, at times gasping for breath. The face, which is puffed and slightly cyanosed, has an anxious expression. The facial lines are obliterated; the tongue coated.

Thorax: Chest, barrel-shaped, expansion on right side diminished; respirations, 36 per minute. Increased vocal fremitus over entire right lung. Complete dulness over right lung anteriorly. Posteriorly flat percussion note below the sixth rib. Bronchial breathing over entire right lung anteriorly. Absence of respiratory sounds posteriorly below the sixth rib; above that bronchovesicular breathing is elicited. A few small moist rales are heard at the end of respiration. Percussion note normal over left side of chest. Compensatory breathing over left lung.

Heart: Negative, save for an accentuation of the second pulmonic sound. Pulse, regular; equal on the two sides; 138 to the minute.

Abdomen: Negative, except for tenderness in the gall-bladder region.

Gynecological examination: Small infantile, movable uterus, with a long narrow cervix.

Ophthalmological examination: The right eye, which diverges slightly, has only bare perception of light. The left eye has vision of $\frac{20}{50}$. There is a left temporal hemianopsia for large test objects. The right optic disk is white, sharply outlined, and the vessels are of normal caliber. The left optic disk shows pallor of the left temporal half.

Examination of the cutaneous sensibility shows an area of hyperalgesia over the chest and the back. All the tendon-jerks were normal, but the abdominal reflexes could not be elicited.

The Wassermann reaction of the serum was negative.

Blood examination: Red cells, 4,848,000; white cells, 11,400. Differential count: Neutrophiles, 40 per cent.; large lymphocytes, 3 per cent.; small lymphocytes, 21 per cent.; eosinophiles, 31 per cent.; large mononuclears, 1 per cent.; transitionals, 4 per cent.

No degenerations in the red or in the white cells.

The eosinophilia was most striking, and the cause for it was diligently sought. The intestines gave no clue to its dependency. The only condition to account for it was the mediastinal and cerebral abnormality. The aspirated material from the chest, a sanguinopurulent, thick fluid, when examined microscopically showed many cells in a state of fatty degeneration. The bulk of the aspirated material consisted of large cells, not conforming to the usual findings in inflammatory exudates. The cells presented a large body almost entirely occupied by an intensely staining nucleus.

A tentative diagnosis of sarcoma of the pleura and of the mediastinum was made, and the patient was submitted to *x*-ray examination, with the following results: Two exposures made with the plate behind show the ribs, spines, and structure around the shoulder very distinctly. There is such a large accumulation of fluid in the pleural cavity that it is impossible to get any detail in the lung on the right side. The heart is slightly displaced to the left, and even the left lung is very much compressed.

From a study of the plates, viewed in a satisfactory light, one readily detected a mediastinal growth about five inches in diameter, the upper end of which was near the sternal notch. The clear-cut, defined edges indicated that this was a mediastinal tumor, but it could not be distinguished positively from an aneurysm.

The clinical interpretation was then, as it is now, that we were dealing with a malignant growth originally of the pituitary body, with metastasis in the thorax. That the former had been in existence many years was indicated (1) by the amenorrhea of many years' duration; (2) by the progressive increase of weight; (3) by the attack of diplopia which occurred eighteen months previous to the sudden monocular blindness; (4) by the blindness (hemianopsia); and (5) by the ophthalmoscopic evidence of pressure upon the optic chiasm.

The patient left the Neurological Institute soon after the diagnosis was made, and died, we are informed, about three weeks later.

The clinical features of the case do not call for special comment. The remarkable phenomenon was the eosinophilia. Although eosinophilia is an easily detectable state of the blood, very little is known of its significance, and still less of its pathogenesis. Ehrlich gives 4 per cent. as the normal upper limit, and 0.5 per cent. as the normal lower limit. There are cases recorded in which no eosinophiles were found in the blood, and cases in which 90 per cent. of the white cells were eosinophiles. In certain of the exanthemata, such as scarlet fever and rubeola, an eosinophilia always exists. In the former as high a count as 23 per cent. was found by Reckzeh.[2] In rubeola the eosinophilia, which appears, as a rule, during

[2] Deutsch. Archiv f. klin. Med., 1903.

desquamation, may reach 8 per cent. In pertussis, as the spasms begin to get less severe and rarer the eosinophiles increase in numbers, and may reach 15 per cent. The well-known eosinophilia in asthma may at times show as many as 33 per cent., and we have seen in one instance as many as 38 per cent. of these cells, which were diminished materially while the patient was being given adrenalin. It is well known that increase in the oxyphil cells is to be found most unvaryingly in helminthiasis. In the cestodic invasions, such as the Tænia solium, saginata, and nana, as a rule, no higher than 10 per cent. is obtainable. The anemia due to the Bothriocephalus latus is more destructive. The nematodes, such as the Ascaria lumbricoides, rarely cause more than 9 per cent.; Oxyuris vermicularis, 14 per cent.; Anchylostomum duodenale, 53 per cent.; Trichocephalus dispar and Anguilula stercoralis, about 13 per cent. The Trichina spiralis is capable of producing the highest known increase in the eosinophiles, and, according to Thayer and Brown,[3] as many as 68 per cent. have been found. In Bilharzia hæmatobium as many as 20 per cent. have been reported.[4] The highest reported in Filaria sanguinis hominis by the above author was 17 per cent.

Genuine uncomplicated rheumatic polyarthritis always shows an eosinophilia, which may reach as high as 11 per cent. In chorea one usually finds an eosinophilia of from 5 to 20 per cent. This is interesting, as the rheumatic joint affections also are accompanied by eosinophilia.

Although pernicious anemia does not, as a rule, show an increase in the eosinophiles, as many as 12 per cent. were found by Bloch and Hirschfeld.[5] My observations showed as many as 10 per cent. and as few as 0.2 per cent.

In leukemias one may find many eosinophiles or none, according to the stage of the disease and the rapidity with which it has developed. In marked tetany about 7 per cent. may be found. In carcinoma or sarcoma up to 8 per cent. have been reported. Gonorrhea in certain cases may show as many as 15 per cent.

The present status of hematology does not permit us to draw prognostic conclusions in gonorrhea from the study of the eosinophiles. A considerable number of the dermatoses are accompanied by eosinophilia; in pemphigus, as high as 33 per cent.; in dermatitis herpetiformis, as many as 27 per cent.; in prurigo, 11 per cent.; impetigo contagiosa, 8.2 per cent.; psoriasis, 17 per cent.; urticaria, as many as 60 per cent.; mycosis fungoides, 37 per cent.; lupus, 12 per cent.; lepra, 28 per cent.

The interesting feature in our case of eosinophilia was the large number of these cells, which, however, does not help in any way

[3] Lancet, September 25, 1897.
[4] Coles, Brit. Med. Jour., May 10, 1902.
[5] Berlin. klin. Woch., 1901, No. 40.

to exclude a nervous condition, nor does it help in localizing the affection. It may be cited as an example of marked eosinophilia in the course of a malignant tumor.

THE HEMATOLOGY OF SATURNISM.

The blood picture in certain cases of lead poisoning is very characteristic. Indeed, it may be considered nearly pathognomonic. As an illustration of this, the following case is cited:

Case II.—A man, aged forty-five years, who had worked as a lead smelter for twelve years, applied for admission to the Neurological Institute March 10, 1910. His complaint was of occasional cramps in the abdomen, which had existed for eighteen months or more, of inability to extend the fingers and hands (double wrist-drop), and of loss of strength in the entire upper extremities. The wrist-drop had developed on the right side in January, 1909, on the left in May, 1909, and the inability to use the upper extremities in February, 1910. The mode of development of his symptoms was indicative of the insidous way in which lead attacks and overcomes the peripheral motor neuron. Examination showed the typical picture of lead neuromyositis. The urinary examination revealed the presence of lead, and examination of the blood showed extensive and marked granular degeneration. The blood picture improved markedly after a course of judicious therapy, and kept pace with the somatic improvement of the patient.

The degenerative changes in the red cells, due to lead poisoning, are quite different from those due to other pathological states. The polychromatophilia is rare in lead changes. The granules in the red cells are also different from the granules found in secondary anemias. They are coarser, and the cells bearing them retain their original color or are slightly paler, whereas in similar degeneration of other blood diseases there is apt to be in the cell afflicted a more or less definite polychromatophilia.

The specific granular degeneration encountered in this case is the only neurohematological affection accepted. This change is not to be regarded in the light of a secondary anemia, but as a specific alteration due to the noxious influences of lead. It becomes quite evident that such is the case when lead eliminative therapy restores the blood morphology to its normal appearance. The modus operandi in the production of these granules is still in debate. Some claim that it is not a degeneration at all, but that the presence of the granules is an expression of protective forces of the body. This conception does not seem to us to carry sufficient corroborative evidence. We believe the granules to be a degenerative change rather than a hemoconvalescent phenomenon. It is a well-known fact that when blood analyses are made ante mortem in patients

who showed among other things granules in the erythrocytes, the number of such cells is very much increased as compared with smears taken during the incipiency of the disorder. When the patient recovers from his illness, the previously found granulations in the reds disappear, and this disappearance keeps pace with the improvement. A positive and negative phase has not been established in the appearance and disappearance of the granulations, and a convalescent significance can, therefore, not be applied to them.

SOME PHASES OF HYPOTHYROIDISM.

CASES III AND IV.—Two cases of nervous disease that do not admit of ready classification, in so far as they do not fit into any definite clinical picture, were those of brothers eleven and seven years old respectively. From a nosological standpoint they are perhaps best classified as dystrophies. The elder child's chief symptom is inability to talk distinctly. Words are not clearly enunciated, and he stops while articulating words and making sentences as if he were out of breath or tired. His hands tremble, he fatigues easily, he eats a great deal, and he never perspires. He goes to school, and he appears to be of average intelligence. He was late in beginning to walk, but he talked at the usual time. On examination the gait was somewhat of a waddling character, the spine showed a distinct scoliosis, the tendon-jerks were absent, and the boy was fat. The cutaneous reflexes were all elicitable. When he arose from a lying posture, it was not in a manner characteristic of the muscular dystrophies. The thyroid gland could not be palpated. Aside from these findings, the physical and mental examination was negative.

Examination of the blood showed: Hemoglobin, 73 per cent.; erythrocytes, 4,362,000; leukocytes, 9600. Differential count: Neutrophiles, 31 per cent.; eosinophiles, 13 per cent.; basophiles, 1 per cent.; large lymphocytes, 7 per cent.; small lymphocytes, 45 per cent.; transitional cells, 7 per cent.

The clinical picture of the brother was somewhat different. He was interpreted as an example of cortical focal encephalitis, occurring in a child possessed of some dystrophic condition of a family type.

This patient, aged seven years, was well up to his second year, when he had an attack of measles, during which he suddenly lost the power of speech, though he was still able to cry. It is said there was no paralysis of the face or of the extremities. Two and one-half years later, when he was above four years old, he began to talk again. At this time it was remarked that the right extremities were weaker than the left. He did not develop mentally as normal children do. His complaint when he was brought to the outpatient department of the Neurological Institute was weakness of

the right extremities, defective speech, mental retardation, and night terrors. Examination showed partial right hemiplegia; deviation of the tongue to the left; knee-jerk and ankle-jerk present on the right side, but absent on the left; Babinski toe phenomenon absent; all the superficial reflexes were present.

The Wassermann test was negative in both cases.

The blood analysis showed: Hemoglobin, 76 per cent.; erythrocytes, 4,680,000; leukocytes, 10,400. Differential count: Neutrophiles, 57 per cent.; eosinophiles, 4 per cent.; large lymphocytes, 7 per cent.; small lymphocytes, 31 per cent.; transitionals, 1 per cent. No abnormalities in the corpuscles.

Although the subject of blood changes due to various hyperglandular and hypoglandular functions is by no means firmly established, there is a tendency, as had been pointed out by Pincus and recently by Kocher, for the blood to respond in a more or less specific manner to disturbed functions of the ductless glands. The gland that receives the most attention is the thyroid. The nervous manifestations which disorder of the function of this gland is capable of producing are varied, but yet not fully recognized, therefore volumes are written on the subject. The hypofunctionating gland not only expresses itself in obesity, cretinism, and myxedema, but there are many other changes, somatic or psychic, that are the result of such malfunction. *Blood that shows a mild leukocytosis and a relative lymphocytosis with eosinophilia ranging from 3 per cent. up should be regarded as highly suggestive of a hypothyroid state.* The blood changes in the above two children presenting such a change, it was decided to class them among the hypothyroid clinical expressions, and thyroid extract was consequently prescribed.

The marked improvement that followed the administration of this substance is the chief reason for presenting the salient features in these two cases.

In these two cases of hypothyroidism there were no other changes save the relative lymphocytosis with eosinophiles mentioned. The difference between the two bloods in only conjectural. To what extent one child showed more of a hypofunctionating clinical picture than the other is not ascertainable in the light of our present knowledge of these conditions.

AN EXAMPLE OF PROMYELOCYTIC LEUKEMIA.

One of the most remarkable examples of blood disease masquerading as nervous disease, a case of acute leukemia resulting in acute transverse myelitis, is the following:

CASE V.—A young Russian Jew, aged twenty-nine years, was admitted January 23, 1911. His complaint was inability to stand or walk, inability to void urine or feces, pain in the middle of the

back. This pain was not severe, but at times subject to exacerbations. A sensation as if the legs and feet were asleep, and occasionally as if the legs were being squeezed. These symptoms came on abruptly ten days before coming to the hospital. During the first week of this time he was able to get about, so that in reality it was not until four days before coming to the hospital that he became paraplegic.

His history was uninteresting, save in one particular, and that was that he recalled on close questioning that seven weeks before the beginning of his ailment, he had what he called sticking pains in the left side of the abdomen in the region of the stomach. These pains continued more or less for three weeks. They were not severe, but nevertheless he consulted a physician, who prescribed for him, and soon after that the pains subsided. He denied syphilitic infection, and aside from having had his legs frozen when a boy of twelve years, he did not recall ever having been ill. He had served as a soldier in the Russian Army for three years (when he was from twenty-one to twenty-four years old), and after that he came to this country and began work as a picture-frame gilder. This occupation necessitated the use of amyl and methyl alcohol.

The first subjective symptoms of the illness which he had when he came to the hospital was a sharp, cutting, shooting pain in the small of the back and in the left side. Two or three days later his legs began to tingle and to feel as if they were asleep. Almost immediately he began to complain of weakness of the legs, and this continued to increase until at the end of the sixth day he was unable to stand or walk. From this time onward he was unable to void urine, and he had to be catheterized. By the time he was brought to the hospital he had a weak, ineffectual, hacking cough and constant dyspnea.

Examination showed that both lower extremities were flaccid and totally paralyzed. The knee-jerks and ankle-jerks were absent. The plantar reflexes and the abdominal and the epigastric reflexes were not elicitable. The sensory disturbances showed an analgesia extending to the umbilicus. The upper extremities seemed to be quite normal.

The pupils were circular, they responded to light and accommodation, and the ophthalmoscopic examination showed the optic nerves to be of normal appearance.

The respiration was short and diaphragmatic. Examination of the chest revealed sonorous and sibilant rhonchi over both lungs, most marked in the upper portion of the right lower lobe. On percussion there was moderate dulness over the lower half of the right lower lobe. This was taken to indicate bronchopneumonia. The temperature was 102°; the next day it was 104°, and the following day 106°.

A blood examination on his entrance to the hospital showed a

marked leukocytosis, and the differential count revealed a remarkable variety of young neutrophilic types of cells. There were very few normal constituents.

The polymorphonuclear leukocytes of normal type were few in number. A considerable quantity of myelocytes and eosinophiles were to be seen. A few nucleated red cells were found, the cytoplasm showing evidences of polychromasia; the great bulk of cells was made up of large diffusely stained mononuclear cells, apparently types of myelocytes.

The following day the blood examination showed the following: Hemoglobin, 70 per cent.; red blood cells, 3,776,000; white blood cells, 28,800. Differential count: Neutrophiles, 50 per cent.; eosinophiles, 16 per cent.; large lymphocytes, 14 per cent.; basophiles, 0 per cent.; small lymphocytes, 10 per cent.; transitionals, 10 per cent.

The red blood cells showed a profound polychromatophilia, Auer rods, anisocytosis, a few with nuclei. The white blood cells showed various myelocytes and an eosinophilia and many irritation forms.

Examination of the cerebrospinal fluid showed that there was a great excess of globulin, no cells, a negative Wassermann reaction, and negative Fehling. The urine was practically of normal condition. The Wassermann serum reaction was likewise negative.

It was noted at this time that the spleen could not be palpated, nor could any area of splenic dulness be determined on percussion. The patient complained constantly of pain in the region of the spleen.

The next day it was noted that over the bases of both lower lobes posteriorly the percussion note was somewhat dull. Anteriorly the percussion note was higher pitched over the right than over the left side. The respiratory sounds over most of the right lung were short in duration and feeble in character. The patient's cough was weak and ineffectual. The pulse was weak and rapid, at times irregular and intermittent.

The next day the patient died, with all the manifestations of a vagus inadequacy and pulmonary edema.

It was evident from the blood findings that, irrespective of the objective signs indicative of a transverse lesion of the spinal cord, what the disease really was could only be explained by some grave disorder of the blood primary or secondary to an undetected infection. A blood culture gave no growth. The blood condition was considered a serious one upon finding the various myelocytes, and because of the presence of young neutrophiles, which were the closest relatives of the myelocyte of the same granulation that we had ever seen. The finding of these cells only reflects upon the strenuous call of the organism to replace the damaged cells, and is to be considered as the early productive phenomena of body resistance. The gravity of the situation from a hematological

point of view was not the myelocytes nor the young neutrophiles, but the secondary changes as shown by the degenerated red cells. Although hematologically such a blood picture cannot be classed among myelogenous leukemias, nor as the acute variety of this disease, in view of the fact that the large number of young neutrophiles constituted the chief feature of the blood anomaly, we believe it justifiable to classify this blood as a new hematological entity, and for the want of something better would designate it as a promyelocytic leukemia containing promyelocytes, as described by A. Pappenheim in his work on *Human Blood Cells*, as well as by one of us (D. M. K.) in the *Folia Hematologica*, 1909, vol. vii.

Even an authority like Grawitz is unable to disentangle the knotty question of the various leukemias. He is forced to declare that the opinions concerning the morphology and pathology of this blood picture are so varied and so rich in exceptions that this last distinction, lawlessness, is perhaps the chief diagnostic feature in this anomaly. We, therefore, do not hesitate in advancing our blood formula as another exception, and deem it permissible to designate the leukemia as promyleocytic.

As emphasized before, there is no separate hematological change to be encountered among diseases of the nervous system.[6] The deviations from the normal in the blood in these diseases, with the exception of lead palsies, belong to the hemopathology of secondary anemias.

Secondary anemia is the outcome of prolonged suffering, and its severity is consonant with the degree of malnutrition. Blood changes that may be directly held responsible for the production of nervous disorder are extremely rare indeed. Case V, which we cite in this communication, is one of this kind. The mechanism producing the transverse myelitis is shown by the pathological findings in the cord. It is more or less of a speculation to explain the etiology of the blood disorder. It is, however, not unsafe to regard an infection as responsible for its production. In this case, particularly, the grave infection overwhelmed the hematopoietic apparatus which hurried to defend the organism by putting out a large force of young phagocytes. It was pointed out by one of us[6] that the most potent leukocyte from the phagocytic point of view is the young representative of the neutrophiles. This cell is capable of engulfing nearly twice as many staphylococci as any other cell. Hence, when a large number of these cells are encountered, it is logical to conclude that their presence is for phagocytic purposes—in other words, an infection is present. Together with full-fledged eosinophilic and neutrophilic myelocytes, as well as the hyperleukocytosis, an ordinary infective

[6] New York Med. Jour., April 13, 1907.

leukocytosis is out of the question, and the condition in our opinion can only be classed among the leukemias, and in view of the presence of the young elements mentioned, the name promyelocytic leukemia is in order.

The significance of the eosinophilia in the case of mediastinal and pituitary tumor is of statistical value only. The origin of the eosinophiles, or rather the stimuli that are responsible for their formation, is still a question to be answered by the experimental hematologists. The interesting work of Opie on this subject may throw some light upon their nativity as well as upon the substance from a chemical point of view, necessary for their increase in the peripheral blood.

A CASE OF BANTI'S DISEASE: SPLENECTOMY FOLLOWED BY TYPHOID FEVER AND APPENDICITIS.

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A considerable number of cases of Banti's disease have already been published and numerous reports of splenectomy performed for the relief of the symptoms of this disease are on record and favorable results have been ascribed to this operation. Although patients who have suffered from this disease and have been apparently cured by splenectomy remain in good health for years, there is hardly anything known of the behavior of these splenectomized individuals during attacks of infectious diseases.

The case of Banti's disease which I wish to present was successfully treated by splenectomy and passed through an attack of typhoid fever one year and a half after the operation. During the course of the typhoid it was necessary to remove the appendix owing to the occurrence of a suppurative appendicitis. It is chiefly on account of the reaction of the splenectomized patient to these infectious diseases that sufficient interest is attached to this case to justify recording it. The existence of syphilis in this case, as shown by the positive Wassermann reaction and by other evidences pointing to hereditary lues, is also of importance.

The following is a brief history of the case, which was referred to me through the courtesy of Dr. William E. Beardsley.

L. G. H., aged seventeen years, female; native of the United States, of German parentage; single, no occupation; admitted to the Jewish Hospital of Brooklyn on January 25, 1909; discharged February 7, 1909. Family history does not offer any significant

facts. She had measles, mumps, and whooping cough in childhood, and some eye trouble three years prior to admission to the hospital; no alcoholic history; only menstruated once eight months before admission and never since. Her present illness dates back five years. She noticed a mass in the upper portion of the abdomen, which was painful at times, especially on pressure, which continued to increase in size. At the same time, she noticed a progressive weakness and loss of energy. She suffered from dragging sensations in the abdomen, slight jaundice and itching, and occasional attacks of epistaxis.

The physical examination showed an undersized, imperfectly developed girl; sclera of slight yellowish tinge; conjunctiva pale; pupils equal and reacting normally to light and accommodation. An examination of the throat did not show anything abnormal; the tongue was moist and clean. The heart was normal to percussion; apex beat was not visible nor palpable; there was accentuation of the second pulmonary sound and a clicking second sound at the apex. The pulse was rapid, soft, and easily compressible. There was dulness from the level of the tenth dorsal vertebra on both sides posteriorly and diminished tactile and vocal fremitus and diminished respiratory sounds. The liver dulness reached from the upper border of the fourth rib to $7\frac{1}{2}$ cm. below the costal margin at the mammary line. The lower border of the liver was easily palpable at that location. The lower border of the spleen was palpable about 9 cm. below the free costal margin. Its notch could be felt two fingers' breadth from the median line, about 6 cm. below the costal arch. The whole abdomen was distended and a diastasis of the recti muscles allowed a mass the size of an orange to protrude just below the ensiform cartilage. The submaxillary glands and the inguinal glands were very slightly enlarged. There was a slight icterus. The hair in the axillæ and around the pubes was scant. The reflexes were normal. There was some ascites, but no edema of the lower extremities. The urine was free from albumin, sugar, and casts; acid; specific gravity 1010. The feces showed nothing abnormal. The Wassermann reaction was strongly positive. The test was made by Drs. Noguchi and Lintz.

The blood examination showed: Red blood cells, 3,200,000; hemoglobin, 48 per cent; leukocytes, 5500; polynuclears, 61 per cent.; lymphocytes, 39 per cent.; eosinophiles, less than 1 per cent.

The specific treatment, which was thorough, and included intramuscular mercurial injections, was not followed by any favorable results, nor was the application of the *x*-rays and the administration of the arsenical preparations of any benefit to this patient.

The temperature curve during her two weeks' stay in the hospital showed only slight rises, reaching at times to a little over 101°. Her pulse varied from 76 to 110, her respirations from 20 to 35 in an irregular way.

The condition of the patient becoming gradually worse, splenectomy was decided upon and was performed by Dr. Walter C. Wood, at the Brooklyn Hospital, on April 26, 1909. The spleen weighed 1 pound 11 ounces, and measured 8 by 4 by 3 inches. It was of moderately soft consistency; there was an area 1½ inches in width at its upper portion, which was soft and semifluctuating. There were numerous whitish areas, which on section showed a cheesy appearance. A microscopic examination showed caseation and giant cells.

From the time of the operation improvement was rapid and continuous, and when she came under my observation again, on September 26, 1909, she appeared to be in a decidedly improved condition. The blood examination the following day showed: Red corpuscles, 5,300,000; hemoglobin, 68 per cent.; leukocytes, 12,800; polynuclears, 58.3 per cent.; lymphocytes, small, 35.5 per cent.; large, 0.04 per cent.

On December 12, 1909, the blood count was: Red corpuscles, 6,160,000; hemoglobin, 65 per cent.; leukocytes, 11,400; polynuclears, 61.5 per cent.; lymphocytes, small, 35 per cent.; large, 2.1 per cent. The eosinophiles were always less than 1 per cent.

There was, therefore, a very remarkable improvement in the condition of the blood, only the percentage of hemoglobin remained comparatively low, while the number of red corpuscles came up to and slightly above the normal limit. The leukocytes increased decidedly in number and came rapidly up to the normal percentage. The relative proportion of the polynuclears to the lymphocytes did not show any marked changes before and after the splenectomy; the eosinophiles were not increased in number.

The patient remained in apparently good health until October 1, 1910, when she was taken with typhoid fever and was placed under my care at St. Catherine's Hospital on the eleventh of that month. The attack was of medium severity; the Widal reaction was strongly positive. The temperature curve differed in no way from that of a typical typhoid up to the eighteenth day of her stay at the hospital, October 28, when a gradual rise of temperature occurred, also a rise in the pulse and respiration, with the setting in of an appendicitis.

October 13, 1910, two weeks after the onset of the typhoid fever, the blood examination was as follows: Red corpuscles, 4,100,000; hemoglobin, 75 per cent.; leukocytes, 4500; lymphocytes, 21 per cent.; polynuclears, 70 per cent.; mononuclears, 7 per cent.; eosinophiles, 2 per cent.; color index, 0.8 per cent.

On October 28, 1910, the day of the onset of appendicitis, the leukocytes were 9800, of which 68 per cent. were polynuclears. The temperature rose during the next two days from 101.8° to 105.4°, with a corresponding rise of the pulse to 135. Chills, severe pain in the right iliac fossa, with exquisite tenderness, resistance at that location, the anxious expression on the face of the

patient, and a rise of the leukocyte count to 15,000 on October 30, pointed to a serious involvement of the intestines at the iliocecal region. The operation, performed by Dr. Frank D. Jennings, revealed a suppurating appendicitis and also a large cystic kidney, which was displaced downward and fixed in its abnormal position. The liver was found smaller than normal and the gall-bladder decidedly paler than usual. The patient made a good recovery, her temperature being of the type of a continua, 103° in the evening to about 102° in the morning, until November 7, when it gradually fell, reaching normal on November 12, the thirty-third day of her stay at the hospital. From then on it showed only slightly rises to about 100, and finally remained normal until her discharge from the hospital on December 11, 1910.

On November 1, two days after the operation, the leukocytes fell to 10,500, the polynuclears being 69 per cent.

By November 16, 1910, the blood count showed: Red blood cells, 4,400,000; hemoglobin, 75 per cent.; leukocytes, 9800; lymphocytes, 25 per cent.; polynuclears, 70 per cent.; mononuclears, 3 per cent.; eosinophiles, 2 per cent.

The patient continued to enjoy good health up to the present time and was examined by me on April 10, 1911. Her weight was 99¼ pounds. There was a slight enlargement of the posterior cervical glands on the right side, but no other glandular enlargement. There were no abnormalities about the chest. The liver dulness began at the sixth intercostal space and reaches down about three fingers' width below the free border of the ribs. The liver felt a little firmer than normal and was smooth. At its extreme right a firm irregular mass could be felt, which was most likely the right cystic kidney as found at the time of the operation. The liver dulness at the mamillary line occupied only two intercostal spaces. The upper and lower middle incisors were slightly notched. Temperature, pulse, and respirations normal. No other abnormalities were found.

Blood examination made on April 7, 1911, showed: Red blood cells, 5,860,000; hemoglobin, 104 per cent.; leukocytes, 11,600; polynuclears, 78 per cent.; mononuclears and transitionals, 2 per cent.; lymphocytes, small, 17.5 per cent.; mast cells, 0.5 per cent. Blood coagulated almost immediately on lobe of ear.

The points which are most evident in this case are: (1) A typical clinical picture of the disease described by Banti, Senator, and others, namely, splenomegaly; the decidedly enlarged liver; the typical blood findings; the slowly progressive exhaustion were well pronounced in this case. (2) The lack of development of the patient, her appearance being that of a child aged twelve years. (3) The positive Wassermann reaction. (4) The rapid improvement in the condition of the blood, with a decided improvement in the hemoglobin following the operation of splenectomy, but not reaching

the normal, and remaining practically stationary for at least nine months, varying from 63 to 78, while in the recent examinations it reached even above normal, 104 per cent. (5) The typical characteristic typhoid, differing in no way from that of patients not operated on, with the exception of the blood findings, which showed a rather high leukocyte count for a case of typhoid and a relatively high polymorphonuclear leukocytosis. (6) The reaction to the surgical interference during the course of the typhoid did not present anything characteristic, and her recovery was as rapid as one could expect in a patient not splenectomized.

The internal secretion of the spleen, which according to modern physiologists[1] activates trypsinogen into trypsin, is either supplied in this case by a supernumerary spleen or spleens, or else is effectively substituted, perhaps, by the succus entericus. At any rate, the proteolytic digestion and metabolism is not deranged.

This case further demonstrates that the enlargement of the spleen in typhoid is not essential to the elaboration of immune substances, again assuming that there are no supernumerary spleens.

There is a possibility that hereditary syphilis and tuberculosis of the spleen form etiological factors in this case, as shown by facts previously stated. Evidences of gastro-intestinal diseases could not be obtained. Willi Schmidt's[2] case, recently published, is that of a boy, aged fourteen years, with retarded development, presenting Banti's disease symptoms and having a positive Wassermann reaction, which was successfully treated by salvarsan injections. In 2 out of 3 cases of Banti's disease recently treated at the Jewish Hospital, of Brooklyn, there was found a positive Wassermann reaction.

Marchand[3] and Chiari[4] reported the presence of hereditary lues in some cases of Banti's diseases. Other cases fail to present any evidence of lues. In the carefully observed case of Emmanual Policek[5] there was a negative Wassermann reaction. The pathological condition was designated as chronic inflammation with connective tissue proliferation and the formation of granulomata, closely resembling tubercles. There were, however, no tubercle bacilli found after splenectomy.

The etiology is still obscure. The success of splenectomy places the chief seat of the disease in the spleen. So much can be conceded at present from the considerable number operated upon, to which the one under consideration may be added.

It is also clear that a toxemia emanating from the spleen is responsible for most of the symptoms observed in these patients. In the cases of this disease that came under my observation, the hemor-

[1] Schiff, Herzen, Gachet, and Pachon.
[2] Münch. med. Woch., March 21, 1911. p. 625.
[3] Ibid., 1903, p. 11.
[4] Prager med. Woch., 1902, No. 24.
[5] Folia Hematologica, 1910, ix, 508.

rhages were most readily accounted for by a toxemia. Neither engorgement of the portal system nor direct pressure on vessels through enlarged intra-abdominal glands seemed to offer a satisfactory explanation for the occurrence of these often severe hemorrhages, while the resemblance to those of undoubted toxic origin was apparent. In one of my cases of this disease hemorrhages occurred early, when there was only very moderate splenic enlargement and no evidence of any involvement of the liver. Is it possible that an excess of internal secretion of the spleen is responsible for the occurrence of the symptoms, such as one observes in that of the thyroid gland? Or is this toxic substance formed through the agency of infection? Sippy[6] found that filtered splenic juice obtained from patients suffering from Banti's disease injected into rabbits caused death in a few hours.

Sciolla, on the other hand, in a similar experiment with splenic pulp failed to observe any apparent effect. Umber found an increased destruction of the albuminoids in this disease, while Arthur Müller[7] found normal metabolism in his case.

In conclusion, I wish to emphasize the remarkable results following splenectomy in my case; the lasting improvement and the ability to combat severe infections. Also the restoration of the blood to the normal condition as to the formed elements and to a marked increase in its coagulability.

REMARKS UPON SOME PHASES OF THE SPASTIC-PARETIC SYNDROME OF CEREBRAL DIPLEGIA.[1]

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If we are to make any signal advance in the treatment and prevention of the spastic-paretic syndrome of infantile cerebral diplegia, we must proceed upon the sound anatomical and physiological laws underlying this disease. At the outset it should be emphasized that infantile cerebral diplegia is not a disease entity, but has a clinical basis only.

It has been stated authoratively that there is a description of Little's disease in Audry's treatise on orthopedics, published in 1741, and that Delpech incidentally published a single case in 1728. But the condition must have existed from the remotest antiquity, and there is no doubt that a careful research into the past, both in

[6] Amer. Jour. Med. Sci., p. 428.

[7] Münch. med., Woch., 1909, No. 45, p. 2316.

[1] Read before the New York Neurological Society, February 6, 1911.

medical and graphical records, would reveal further evidence of the condition. While this statement might not hold good for Little's disease, *per se*, as an accident of childbirth, we should consider the frequency of spastic states in hysteria of young girls and admit that such cases might easily be confounded with organic disease originating in early childhood. In 1840 Heine, the pioneer worker in poliomyelitis, anticipated Little by giving a good description of the syndrome, which, however, he named "spastic cerebral paraplegia." This discovery in nosography probably passed unnoticed; just as happened when Little, in 1861, published his classic account of the syndrome which now bears his name. Many of the points elaborated by Little had to be rediscovered later; showing that the medical world did not really assimilate Little's work until years after its publication. The reason for this lack is not far to seek. Little's syndrome was looked upon at first as an obstetrical subject; it then became an orthopedic subject; today it is admittedly a neurological subject. It is, however, an excellent illustration of a borderland disease, and these disorders are almost invariably neglected, and viewed from a partisan standpoint. Fortunately several of the most popular German journals consider only these borderland subjects, whereas American medicine has been very slow in adopting this practice, and therefore lacks much in harmonizing and bringing up to date our knowledge of many subjects.

Some years after Little's publication Erb and Charcot independently described a form of developmental spasticity of spinal origin. The mental state in such cases was, however, normal, hence the cerebrum was supposed not to have been involved. Today we know that Little's syndrome may be due to an intracranial infection, and yet the intellect may be unaffected. On the other hand, the number of cases of spinal spasticity in children recorded in the literature is steadily multiplying. The syndrome follows or accompanies many injuries and diseases of the medulla and its membranes. Naturally, from the beginning much controversy has arisen as to the respective parts played by the brain and spinal cord in these cases. Such a controversy led still to others: What was to be understood by Little's disease? Should it comprise other forms of rigidity or spasticity in childhood, including double athetosis and congenital chorea? Should one believe that the brain and spinal cord might be individually injured in labor, with the production of two syndromes?

As intimated above, and as still holds true in our day, some writers could not dispossess themselves of the idea that injury of the brain must be accompanied by idiocy and *vice versa*. In searching the literature of our subject one must bear this obsession constantly in mind. Inasmuch as spasticity was commonly associated with high degrees of mental defect, the account of Little's disease has been much overcharged.

In attempting to explain the spasticity of cerebral diplegia, it is

not, therefore, surprising that two views soon came into prominence: (1) The dualistic, which makes of the results of cerebral and spinal accidents two different diseases; and (2) the unicistic, which, eliminating all spinal cases from causes *in loco*, insists that a cerebral element is invariably in evidence in Little's syndrome, and allied states. Marie, one of the earliest writers on the subject, believed that the so-called spinal cases were really due to vices of development, and that they occurred with special frequency in premature children. To him we are especially indebted for bringing out the fact that an affection in the pyramidal tract, throughout any part of its course, might at least in its early developmental growth, lead to a common result. Hence subdevelopment, or a lesion anywhere in the cerebrospinal center which comprised the pyramidal tract, might be held responsible for Little's syndrome. Thus, given a lesion high in the motor area of the brain, we should expect coincident idiocy, epilepsy, etc., and if the lesion occurred in the lower part of the pyramidal tract, the symptoms would vary accordingly in range and degree of spasticity and mental deficit. Marie's views would seem to solve our difficulties completely were it not for the fact that in many cases of diplegia, to be mentioned later, there exists no demonstrable lesion anywhere throughout the pyramidal tract. Physiologically, as we shall see later, Marie's views may not be so incorrect after all. In passing, it is of considerable interest to note the summation of Van Gehuchten's elaborate study that a premature birth, by reason of the subdevelopment of the nervous system, must impose a very different condition from a difficult labor with its attendant asphyxia, yet he leans to the spinal view in causation of spasticity, a theory hard to consider, much less understand.

The unicistic view makes of Little's disease a cerebrospinal affection, the spinal phenomena being a result of the cerebral disease. If one accepts this view the syndrome offers infinite variety—spastic paraplegia, generalized rigidity, double athetosis, congenital chorea, etc. But some would exclude from this picture all hemiplegias, whether of one side or both sides. Raymond was one of the first to grasp the idea that spasticity and paralysis are equivalents, and may replace each other or be found side by side. Earnest attempts have been made for several years to do away with the term Little's disease as such, and speak of it as Little's syndrome or the spastic-paretic syndrome. To such workers it is a matter of the insufficiency of autopsies, not of clinical material (Déjerine, 1903).

The idea is not without point when we consider that in the current literature the syndrome has its index, even in its simplest classification, under the headings of general muscular rigidity of cerebral origin, paraplegic rigidity, double spastic hemiplegia, double athetosis, and generalized congenital chorea. It is not a

little surprising to find from actual analysis of all the classic material of our subject at hand, that the true and typical development of Little's syndrome requires there shall have been a prematurity of birth as well as an asphyxia, and in this manner the undeveloped pyramidal tracts become unduly compressed (Baudon).

In an analysis of 38 cases of asphyxia at term, 11 showed paraplegia, 15 generalized rigidity, 7 transitional forms, 2 hemiplegia, and 3 athetosis and chorea. The small incidence of cases in such a common accident as asphyxia at term has prompted a question whether there was not an antenatal toxemia present, such as tuberculosis or syphilis. The autopsy findings in 44 collected cases showed 24 with general rigidity, 9 with spastic paraplegia, 3 with unilateral spastic hemiplegia, 2 with spastic diplegia, and 5 with double athetosis. Of the 24 cases of generalized rigidity, the brain was normal in 6, the cortex was atrophied in 5, there was porencephaly in 3, adherent pia in 3, thickening of dura with or without adhesions in 4, hydrocephalus in 2, microgyria in 1. The cord was normal in 6, while in the other 18 it showed arrested development or sclerosis of the pyramidal tracts. The cases of double athetosis were not included. In the 9 cases of paraplegia there was atrophy of the convolutions in 3, hydrocephalus in 2, porencephaly in 2, and meningo-encephalitis in 2. Generally speaking, all these lesions were associated with agenesis of the pyramidal fibers. It will occasion no surprise if we attempt no conclusions from this limited data, other than that the pyramidal tracts may be perfectly intact despite the presence of spasticity (Spiller, Speilmeyer, Rolly, Déjerine, Hausholler, Collins, and Rhein). This fact is of no mean importance and well compensates us for citing statistics at this time.

Furthermore, at autopsy it is not possible to differentiate a paraplegic brain from a diplegic, nor a diplegic from a choreic or bilateral athetosis, nor can we differentiate a diplegic from a double hemiplegia. One must admit in passing that there is still great confusion in the nosology of the disease, owing to the fact that complete and modern studies of the entire brain are rarely made in idiot asylums in any country, a neglect which renewed interest in the whole problem of developmental defects in such children should remedy at no distant date. The brain in many cases of the spastic-paretic syndrome of diplegia, apparently showing little or no change to the naked eye, might easily show agenesis in microscopic study. We should not forget, however, that even agenesis is not essential for the production of Little's syndrome, for a lesion anywhere in the motor path below the cortex may produce the same result. It is also well known that a similar breadth of variation may occur in infantile hemiplegia. A similar mechanism of degeneration of the neuron is supposed to account for the senile spasticity without evidence of gross lesion, as in senility where an intracortical pathology is postulated.

In a study of the atypical forms and variations of the spastic syndrome, especially in connection with agenesis, one is confronted with a steadily increasing number of cases of the hereditary, familial type of the disease. Some writers have described it purely as a form of spinal agenesis, but there is plenty of evidence that an analogous condition of cerebral origin also exists, although it does not ascend much above the decussation of the pyramids. In still a third class of cases both the brain and cord are found fully intact. In all these cases, however, lesions when found are seated low in the brain. It is not surprising to note that complete cerebral and spinal analysis at autopsy frequently reveals nothing to account for the condition. The lesson we learn from this type in reference to the spasticities is that there is not always evidence of the causal factors of Little's syndrome, and in a possible majority of cases there is no organic disturbance to be found even with the microscope. The affection is, therefore, probably a true neurosis.

In sharp contrast to this view of looking for a definite organic basis for spasticity, the recent work upon the variant forms of pseudotetany needs to be considered. Two recent American writers, overwhelmed, so to speak, by the wealth of material on spasticity and the extreme limits of the etiology, have endeavored to bring the entire syndrome under this head. If we follow up the subject carefully under its enormous literature, we are surprised in the frequency with which the pseudo type occurs in the disorder of the central nervous system known as the persistent spastic myotonia of Hochsinger, or, better, as the pseudotetany of Escherich. It is supposed to depend upon a form of dry meningitis. There is this parallelism between pseudotetany and Little's syndrome: there is no necessarily central lesion in either, and pseudotetany is sufficiently common in many forms of encephalitis, chronic hydrocephalal, and other brain lesions. While ordinary tetany may be due to a toxemia, pseudotetany must be otherwise accounted for. Many of its descriptions shade into conditions which Escherich has shown to be not unlike the Little syndrome. We find many undiagnosticated conditions of cerebral spasticity in children described as Little's disease which would more properly be termed pseudotetany. If we compare the two conditions, they are not so dissimilar in clinical manifestations. Space forbids a consideration of this analysis here.

One of the most interesting and instructive phases of our subject is the combination of spasticity and flaccidity in the same case. This type was not long ago thought to be rare. Indeed, Förster discussed the subject last year in an extensive paper. Most of us would hold it an axiom that spasticity from its very nature cannot exhibit flaccidity, and that a true association of the two would be extremely rare and anomalous. I have demonstrated, however, in my service of more than 200 cases at the Randall's Island Insti-

tution that this association may be shown in many cases, and that the ratio between the two conditions has a wide variation to different tests. Thus, some spastic muscles may show unusual weakness, and the flaccid types of muscle may be made to show spasticity. Many cases of the preponderating flaccid type may be also combined with ataxia. The absence of cerebellar lesions in the few cases of this type which have come to autopsy makes the understanding of these cases difficult indeed.

The flaccid and mixed types have the same etiology and pathological changes as the classic spastic cases. The typical flaccid paretic types cannot stand or walk, and never learn to do so. There is a notable absence of muscular resistance, and the muscles can be stretched without pain. The joints even can be flexed or extended beyond their normal limits. The electric reactions are normal, but there is some form of voluntary motion, although the movements are purposeless. The limbs can be moved with great activity in some cases, and the reflexes in many cases are normal. Most of these children show evidences of severe cortical lesions—defects of intelligence, aphasia, and not infrequently convulsions. Here and there, in addition to spasticity, choreic movements and strabismus are also in evidence. One of Förster's cases had an opisthotonos of the neck and back. In one of these flaccid cases Förster has reported a Babinski reflex, distinct spasticity and heightened reflexes. Most of the spasticity in these cases is developed in looking for resistance. In the few cases that have been autopsied the forebrain has been found atrophic and sclerotic; this fact enables us to understand, in part at least, the ataxia and incoördination developing on the extreme hypotonus. One is often so engrossed in studying the typical phases of spasticity in cerebral diplegia that these unusual flaccid, atonic-astatic cases, as Förster calls them, have been overlooked and neglected. Careful study of them in the near future must throw a flood of light on the genesis of spasticity.

Inasmuch as anatomicopathological research has been so barren in fully explaining the spastic-paretic states of cerebral diplegia, we may profitably turn our attention to the physiological studies upon this disorder. These we find largely in the German school, and more especially in the work of Förster.

It is most important for us to recognize that the main descending paths of conduction from the cortex to the spinal cord are the pyramidal tracts, although the extra-pyramidal tracts play a role in the sequent spasticity from pyramidal tract disease. Two components are in evidence when an interruption occurs in the pyramidal pathways. The first is a corticospinal impulse sent through the pyramids to the anterior roots and to the muscles, which increases tension and induces contractions. Many static and kinetic disturbances follow an interruption in this corticogenic

impulse. This kind of motor disturbance may be termed the paretic component. Hence an acute interruption by destruction or great irritation of the pyramidal tracts in the internal capsule causes the well known hemiplegic syndrome. The failure of this corticogenerating impulse accounts for the spontaneous resolution in the paralyzed muscles, or, if the hemiplegia develops slowly, the muscle movements are greatly limited in range and degree. In the legs, for instance, there can be no marked voluntary dorsal flexion of the foot, flexion of the thigh, outer rotation and abduction of the thigh. The opposite movements may be performed a little better, but here, too, the range and freedom of individual movements are likewise affected. The manner in which spontaneous restitution occurs in these cases is in no small part bound up with the intact direct pyramidal tracts, and the homolateral accessory paths which, under automatic control, and even under some voluntary control, are capable of increased development by exercise and special mechanical therapy.

The absence of muscular tension generated from the cortex, as shown in hemiplegics, is not only in evidence by a loss of voluntary motion, but is also seen in the presence of involuntary action both of a static and kinetic character. Thus, there is a defect in contraction of the dorsal flexors of the foot, especially the extensor digitorum and the flexors of the leg, and there is also a defective tension of the extensors and adductors of the pelvis and flexors of the knees, hence the peculiar "scissors" gait of diplegics. These combined defects are much more pronounced when they involve the upper extremities, since the fingers are highly specialized in complex movements.

In the spastic-paretic syndrome of diplegia the duplex lesions in the cortex cause a loss of segmental movements in the limbs. While interruption of the pyramidal path abolishes or diminishes the corticogenic excitability of the muscles, the peripherogenic excitability increases it. Here we see that the peripheral excitability acting either through spinal or subcortical centers outranks even the inhibitive influence of the pyramidal tracts. For even in complete destruction of the pyramidal tract the peripherogenic influence may cause spasticity in flaccid muscles, independent of cortical inhibition. This is proved clinically in the rare flaccid type of cerebral diplegias in which spasticity may be shown by developing a strong peripherogenic impulse in examining old contractures, a fact taken advantage of in the training of such cases and in those spastic cases rendered flaccid by dorsal root section.

We thus come back to the twofold make-up of the pyramidal bodies, which contain inervation fibers which transmit tension impulses and inhibitory fibers which preside over spinal cord reflexes. The tension impulse is a continuous one, antagonizing the steady stream of peripheral impulses, so that the latter are held in check.

These conceptions are the only ones adequate to explain that with sudden interruption in the pyramidal paths, special reflex activity is gradually increased. Certainly, the old idea that progressive development of imperfect pyramids in infancy creates a physiological irritation or tension is no longer adequate in the light of clinical and pathological facts. Further corroboration of the newer view is shown in that, as a general rule, the more destruction of the pyramids there is in diplegia, the less voluntary motion there is, likewise the increase in flexor reflexes is found. However, this is not invariably true in all cases of paraplegic types of infancy.

The enhanced spinal reflex excitability is further shown in that voluntary motion may be accompanied by involuntary acts; thus, voluntary flexion of the leg may be accompanied by involuntary dorsal flexion of the foot. The voluntary act somehow liberates a reflex which becomes an involuntary movement.

A number of instances might be cited to show that some diplegics lose the power of isolated movements. We sometimes see a leg or arm fully capable of involuntary motion because of intact corticogenic excitability, yet in the movements of these limbs one may produce synchronous involuntary movements. The only pathological phase which these muscles under study present is a greatly increased reflex excitability. It is entirely proper to question here whether the acts just described are not overflow impulses passing by extra pyramidal tracts, or, still more pertinent, an affair of the lower peripherospinal reflex. It is certain, however, that these involuntary associated movements are subcortical in origin and explanation. Separate intracortical reflex centres are not necessary, as some of the French school have elaborated.

The abnormal involuntary tension which appears in diplegics when their muscular insertions are approximated is due to the increased reflex excitability of the muscles. Curiously enough this spastic muscular contracture is not seen in many cases at first, but as soon as the insertion points are approximated a few times or allowed to remain so awhile, involuntary tension quickly appears. In a few weeks even old stationary cases may be converted into irreducible spasticity. Here, at least, orthopedic alarm is justified. Muscle atrophy, too, quickly succeeds in these neglected cases, a curious fact worthy of further study.

While spastic contracture is only a product of an extreme degree of heightening the normal muscular tonus, the manner in which this is brought about is a very complicated, interacting, subcortical mechanism. The lesion of the cortex inducing the morbid train of causes in the spasticities of cerebral diplegia is but the simplest part of the postulate. Under normal conditions we see an involuntary reflex process called forth by peripheral sensory irritants which arise in the joints, tendons, ligaments, and especially in the muscles at the moment of approximating the insertion points.

The impulse passes along the sensory nerves and posterior roots into the gray matter of the cord, whence it is again transmitted to the muscles. It is always under the inhibitory control of the superior pyramidal tract acting on the spinal nuclei of the muscles. Thus, the conflict in the spastic-paretic state of diplegia is a three-cornered one, lying between the amount of corticogenic tension impulse, the peripherospinal reflex, and the inhibitory control from the cortex through the partly destroyed pyramidal tracts.

The chief phenomena by which the spastic-paretic state of muscle in diplegics is to be recognized are: (1) Increase of tendon reflexes; (2) increase of skin, periosteal and soft part reflexes; (3) the appearance of extensive and intensive involuntary associated movements in connection with definite voluntary movements, which, in turn, may even amount to impossibility of isolated movements; and (4) spastic muscular contracture (Förster).

We must remember however, that the inhibiting function of the pyramids is throughout independent of the influences which cause muscle contracture, for there are many cases of inhibition without contracture and *vice versa*. But in the great majority of cases the inhibiting function is in evidence. The inhibiting function of the pyramidal tracts suffers earlier and more frequently than any other; in other words, it may be counted more vulnerable than the increased reflex activity of the muscles and the paresis of the voluntary muscles. The above view is enhanced when we remember that with few fibers spared to the pyramidal tract anywhere in its cerebrospinal path, the amount of corticogenic impulses capable of being generated may be fairly amazing. The possibility that many such impulses are transmissible by extra pyramidal tracts and by the homolateral fibers must be thought of and studied. All possible variations of transmission of corticogenic impulses are needed, however, to explain the association, often side by side in the same case of some voluntary motion, some flaccid palsy, and a certain amount of spasticity.

This field is worthy of continued, painstaking study from all sides. It is only by such work, clinical, experimental, and pathological, that we can hope to arrive at any rational therapeutics for the spastic-paretic states of cerebral diplegia.

ATHEROSCLEROSIS, WITH SPECIAL REFERENCE TO THE PHYSIOLOGICAL DEVELOPMENT AND PATHOLOGICAL CHANGES IN THE INTIMA.

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The present paper is based on the microscopic study of the vascular system of 20 cases selected from about 300 autopsies studied in Berlin and Munich during the spring and summer of 1908.

The material was selected with the object of studying the physiological development, as well as the pathological changes occurring in the vessels from infancy to old age, and while not as complete as might be desired in late adolescence, yet the essential changes are fairly well covered.

The vessels usually selected for microscopic study were the aorta, pulmonary, renals, splenic, coronaries, præfossæ Sylvii, and in many cases various others.

For the physiological studies these were often cut both longitudinally and transversely, in order that the details of structure might better be made out.

The material was fixed in 2 to 10 per cent. formol for a day or so, and then sectioned with the freezing microtome, after which the sections were preserved in distilled water until stained, which was usually on the following day.

Carmine or hematoxylin were chiefly used as nuclear stains, the former usually combined with Weigert's elastic stain and the latter with Sudan III for fatty degeneration.

Protocols of each case, containing the age, sex, clinical diagnosis, and gross pathological changes, were made at autopsy.

In the study of the sections an exact description of the objective findings in each tunic, with the various stains, was dictated at the time of examination, but the limits of this paper preclude more than the briefest abstract of what appear to be the more important points.

Case I.—Male, aged five months. Cause of death unknown. Nuclear stains of the aorta, subclavian, and carotid show the intima to consist chiefly of polymorphic connective tissue cells. In the superficial layer, where the intima is slightly thickened, are a few clusters of round cells. A definite elastic lamella with very slight fissions containing a few apparent muscular cells separate intima and media.

Case II.—Male, aged eleven months. Died of ileocolitis. Sections of the descending portion of the arch of the aorta show the elastica interna to consist of a deeper, well-defined lamella, and a superficial, less compact, parallel layer, between which is a longitudinal muscular band. The common iliacs show slight fission of

the elastica interna containing longitudinal muscular elements. The larger splanchnic arteries show, likewise, splitting of the elastica interna into two or three layers with cellular inclusions of a muscular or connective tissue nature.

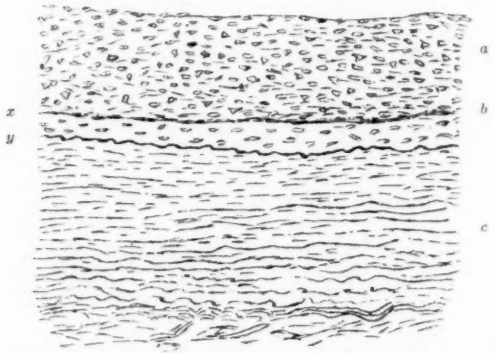

FIG. 1.—Longitudinal section of the aorta of Case II, a male, aged eleven months. In this and the subsequent drawings *a* represents the connective-tissue layer of the intima; *b*, the longitudinal muscular layer of the intima; *c*, the media; *x*, the elastic marginal stripe, and *y*, the elastic marginal lamella; both developed with the inclusion *b* from the original elastica interna.

CASE III.—Male, aged three years. Died of milliary tuberculosis. There is a small area of fatty degeneration in the superficial layer of the intima of the aorta and a suggestion of a longitudinal muscular layer in its depths. The intima of the pulmonalis consists of a narrow layer of connective tissue cells and a few elastic fibers.

CASE IV.—Female, aged eight years. Died of acute lymphatic leukemia. The intima of the aorta consists of a marginal layer of polymorphic connective tissue enclosing a rather indistinct network of fine elastic fibers, and a deeper longitudinal muscular layer lying between two parallel longitudinal elastic lamellæ. A capillary vessel is seen in the latter coat. The pulmonalis shows no longitudinal layer in the intima, and the elastic fibers of this tunic are very fine. There is some round-cell infiltration in the media and adventitia of these vessels (lymphatic).

CASE V.—Male, aged thirty-one years. Died of aortic insufficiency (syphilitic). There is an organized thrombus on one of the aortic valves, numerous sclerotic plates in the aorta, and pessary-like thickenings around the mouths of the intercostals. There are fatty spots on the coronary intima and the renals appear thickened. The depths of the sclerotic plates show fatty and calcareous degeneration. These thickenings show both connective tissue and elastic tissue increase. The musculature of the media is in some places almost completely destroyed by perivascular connective-tissue formation.

The intima of the renals shows proliferation of the connective-tissue layer, but the elastica interna is distinct, showing only the slightest fissures with connective tissue or muscular cell inclusions.

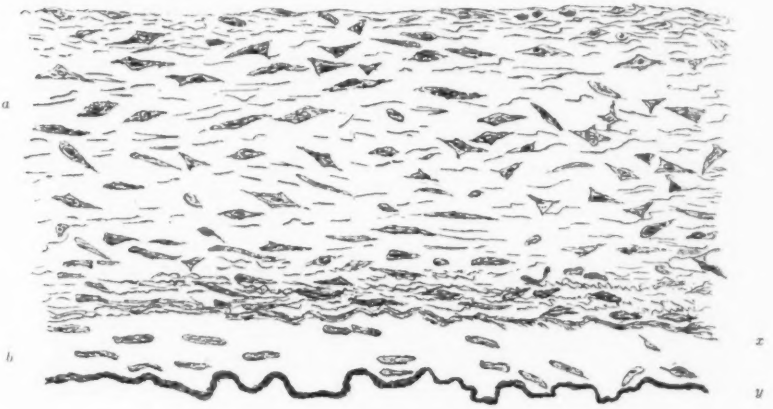

FIG. 2.—The same as Fig. 1, showing only the intima. × 350.

CASE VI.—Male, aged thirty-three years. Cause of death unknown. There is extreme hypertrophy and dilatation of the right ventricle, caused by a primary sclerosis of the secondary and tertiary branches of the pulmonary artery. The systemic vessels appear normal. The intima of the aorta consists of a superficial layer of polymorphic connective-tissue cells and fine elastic fibers, a middle layer, consisting of three or four fairly definite longitudinal elastic stripes enclosing a few cells with longitudinal elongated nuclei, and a third layer, bordering the media, consisting of longitudinal muscular and coarse longitudinal elastic fibers. There is slight thickening of the intima of the primary pulmonary artery, but the secondary and tertiary branches show extreme thickening of both the superficial connective tissue and deeper elastic layer, either of which is thicker than the media. The elastic layer is composed of coarse, rather compact elastic fibers enclosing a considerable number of deeply staining cells which appear to be muscular.

CASE VII.—Male, aged thirty-three years. Died of peritonitis from carcinoma ventriculi. The aortic intima shows the three layers, but the lamella usually seen separating the longitudinal elasticomuscular coat of the intima from the media is here not well defined, but passes in some places into the elastic framework of the media. The intima of the renals is considerably thickened and the elastica interna shows some fission, with muscular inclusions.

CASE VIII.—Male, aged thirty-eight years. Died of cardiorenal disease. The viscera are congested and the kidneys show scars of

numerous old infarcts. The mitral and aortic valves and the aortic bulb show evidence of sclerosis. There are fatty elevations on the intima of the aorta and common carotid, showing no connective tissue increase, a sparse round-cell infiltration, and a granular attenuated appearance of the intercellular substance suggestive of edema or fatty degeneration. There is a longitudinal elastico-muscular layer in the depths of the carotid. A similar layer is seen in the left coronary. The renals are sectioned at their point of bifurcation, where the elastica interna is broken up into two or three different layers, the intervening spaces lodging a few muscle or connective-tissue cells. The other coats of these vessels are normal.

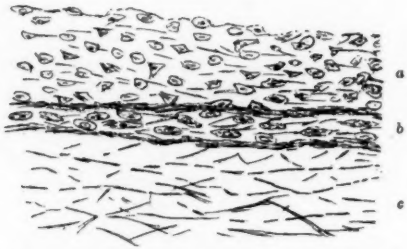

FIG. 3.—Longitudinal section of common carotid of Case VIII, a male, aged thirty-eight years, showing longitudinal muscular layer of the intima developed between the two lamellæ of the original elastica interna.

CASE IX.—Male, aged thirty-nine years. Died of pernicious anemia. The deeper layer of the aortic intima shows what are evidently longitudinal muscular elements. Near the mouth of the celiac the intima consists of a superficial connective tissue and a deep longitudinal layer, the latter disappearing after passing into the mouth of the celiac. The intima of the common carotid is thickened throughout about one-third the circumference of the vessel, and is separated from the media by a distinct elastic layer. There is a slight thickening limited to the superficial layer of the intima at the mouth of the left coronary. There is fission of the elastica interna into two or three layers throughout a part of the vessel's circumference in both renals and the splenic. The media and adventitia of most of these vessels show connective-tissue proliferation and round-cell infiltration, which I believe to be due to the anemic state.

CASE X.—Male, aged forty years. Died of typhoid fever. There are fatty spots on the aorta and pulmonalis which show, microscopically, degeneration of the superficial layer of the intima. The deeper layer of the intima reveals a fatty degeneration of a different type. Here the cytoplasm of the cells shows fatty changes, while the nuclei of some of them are still well stained. The elastic fibers are not

fatty degenerated. The above cells belong to the longitudinal muscular layer.

CASE XI.—Male, aged forty years. Died of tuberculous meningitis and pulmonary tuberculosis. The intima of the aorta shows a few scattered fatty patches. There is slight sclerotic thickening around the mouths of the coronaries and the intercostals. In the superficial layer of the intima of the bulb of the aorta and the pulmonalis a few round cells are seen. In the depths of the intima of the aorta a thin longitudinal muscular layer is seen. The elastic elements of this deeper layer of the intima consist of two or three rather distinct stripes which in some places break up into numerous finer layers. The arrangement of the deeper portion of the intima is not so distinct here as it usually is in the descending portion of the arch and the thoracic and abdominal portion. Longitudinal sections of the iliacs show very fine elastic fibers in the connective tissue layer of the intima. The elastica interna consists throughout a part of the section of a single definite lamella, while at other places three or four closely lying parallel layers exist which diverge from each other on approaching the aorta. Sections of the carotid and left coronary show fission of the elastica interna. Sclerotic portions of these vessels show that the thickening is confined chiefly to the tissue lying between these two elastic lamellæ.

CASE XII.—Female, aged forty years. Died of diffuse peritonitis from operation for carcinoma uteri. The renals and celiac arteries appeared slightly thickened. The intima of the aorta consists of a superficial connective-tissue layer enclosing fine elastic fibers; a middle, rather loose meshed, fibrous network, with its cell inclusions, separated from the superficial layer by a rather coarse longitudinal elastic stripe, and an external layer consisting of coarse longitudinal elastic fibers and longitudinal muscle cells. There is no elastic lamella separating the intima from the media in the pulmonalis, the two blending insensibly into each other. Both renals and the celiac show fission of the elastica interna, but no connective-tissue thickening internal to this. The splenic shows no such fission in its elastic lamella. There is perivascular connective tissue proliferation and small-cell infiltration around the vasi vasorum in the larger vessels.

CASE XIII.—Female, aged about forty-five years. Died in an insane hospital. The aorta shows extensive sclerotic and calcified patches in the intima throughout, most marked, however, in the arch. The absence of atheromatous ulcers with such extensive sclerotic changes justifies, immediately, the diagnosis of syphilitic mesaortitis. Microscopically, the fibrous thickenings in the intima and media, with the perivascular infiltrations and proliferations (Mesaortitis Syphilitica or Periarteritische Flecken), confirm the macroscopic diagnosis. Sections of the renals show very slight fission of the elastica interna. The intima of the right coronary con-

sists of a superficial connective tissue and a deeper longitudinal muscular layer.

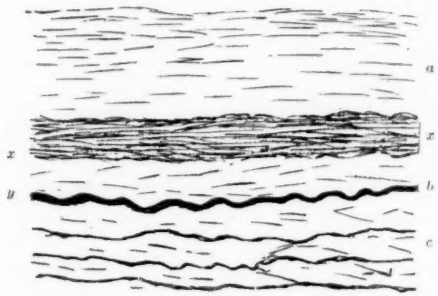

FIG. 4.—The physiological evolution of the elastic elements of the aortic intima. The hyperplastic middle layer developed from the internal lamella of the elastica interna or the elastic marginal stripe is shown at *x*.

CASE XIV.—Male, aged forty-six years. Died of purulent meningitis. The aortic bulb, arch, and thoracic portion, the innominate, both carotids, and the subclavian all show sclerotic and fatty spots on the intima. The Sudan stain shows two different processes to exist in the intima of these vessels. The connective-tissue cells of the superficial layer show moderate fatty degeneration of their cytoplasm. The round cells in these areas are not degenerated. The deeper layer of the intima shows much more extensive fatty degeneration. Here in some places the cell structure is completely destroyed and its place occupied by long chains of fat globules. The elastic fibers in this layer are, likewise, undergoing fatty changes, the fat existing in them as the very finest granules, even when studied with the oil immersion lens. The renals show considerable thickening of the connective-tissue layer of the intima, and the elastica interna is split into several layers or broken up into fibers throughout a considerable portion of its course. The splenic shows lamellation of the elastica interna and considerable thickening of the connective-tissue layer. The left coronary reveals enormous thickening of the connective-tissue layer of the intima and the existence of a well-defined longitudinal elasticomuscular layer of the intima. The latter and the deeper portion of the former are extensively involved in fatty degeneration, in both their cellular and elastic elements.

The intima of the larger vessels shows two distinct processes—a superficial fatty degeneration of the connective-tissue layer, probably due to the infection, and an atherosclerotic process, most pronounced in the deeper layer of the intima.

CASE XV.—Male, aged forty-seven years. Died from myxosarcoma of the mediastinum. The aorta, coronaries, renals, and splenic appear sclerotic, the coronaries markedly so. The latter

vessels show fatty degeneration of the cellular elements and elastic fibers in the deeper portion of the intima, the latter tunic being markedly thickened. There is only slight fission of the elastica interna, but no distinct longitudinal muscular layer is seen. The renals show no splitting of the elastica interna. The splenic shows considerable thickening of the connective-tissue layer and the elastica is split into two or three layers throughout a part of the circumference of the vessel.

Case XVI.—Female, aged forty-eight years. Cause of death unknown. Mitral stenosis, vegetative endocarditis, multiple infarcts, and sclerosis of the pulmonary arteries characterize the vicious circle in this case. The aortic bulb shows slight evidence of a longitudinal muscular layer in the deeper intima. The connective-tissue layer is distinctly thickened. The longitudinal muscular layer is much more marked in the abdominal aorta. The right renal is normal and the elastica shows only the slightest fissures. The left renal and left vertebral show fission of their elastica interna, and the splenic a considerable thickening of its intima.

Case XVII.—Male, aged fifty-one years. Died from operation for carcinoma of the esophagus. The aorta, femoralis dextra, renals, splenic, and left coronary all appear macroscopically thickened. The longitudinal muscular layer of the aortic intima is not very well developed. The femoral shows pronounced thickening of its intima throughout a considerable portion of its circumference. The deeper layer of this coat, consisting of numerous coarse elastic fibers and cellular inclusions, shows fatty degeneration of both these elements. The elastica interna of the right renal is broken up into numerous fibers at two antipodal points of the vessel. These undoubtedly represent an approach to the point of bifurcation of the vessel. The connective tissue layer of the intima of the left renal is slightly thickened. The splenic shows fission of its elastica interna with inclusion of a fairly well developed longitudinal muscular layer. There is a pronounced eccentric thickening of the intima of the left coronary which involves both the superficial and deeper layer. The fatty degeneration is much more marked in the deeper than the superficial layer.

Case XVIII.—Male, aged fifty-six years. Died of Addison's disease. There is no distinct longitudinal muscular layer in the intima of the aorta. There is pronounced fatty degeneration of this tunic, particularly its deeper layer which is composed of coarse elastic fibers and connective tissue or muscular cells. Both of these elements are extensively degenerated, and the Sudan stain shows this fatty degeneration to extend to the muscular elements throughout about half the thickness of the media. There is considerable diffuse and perivascular round-cell infiltration in both these coats. Both renals show the elastica interna as well-defined elastic layers with only the slightest fission, these fissures containing a few connective or muscu-

lar cells. There is slight thickening in the connective tissue layer of the intima in two or three places in these vessels. The elastica interna of the splenic is split up into different layers or bundles. There is pronounced thickening of the connective-tissue elements of the intima involving about half the vessel's circumference. In the coronaries there are well-defined longitudinal muscular layers in the deeper portion of the intima, one of which extends throughout the entire circumference of the vessel and is enclosed between definite elastic lamellæ. This layer shows marked fatty degeneration, while the superficial or connective tissue layer is only very slightly involved. The basilar and præfossæ Sylvii show hyperplasia of their connective-tissue layer and slight fission of the elastica interna, the latter in the former vessel having taken the Sudan stain. It is uncertain if the small-cell infiltration seen in several of these vessels is a part of the Addison's disease, or secondary to the extensive fatty degeneration.

Case XIX.—Female, aged sixty years. Cause of death unknown. The larger vessels were markedly sclerotic. There is extensive fatty degeneration of the intima, most pronounced in the deeper layer, which is composed of coarse fibers and longitudinal muscle cells. There is a sparse diffusion of small cells in the intima. The media shows no degeneration. The renals and right vertebral show connective-tissue thickening and fission of the elastica interna. Extensive fatty degeneration of this coat of the latter vessel, particularly its deeper portion, is present, involving both cellular and elastic elements.

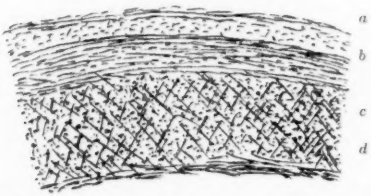

Fig. 5.—Longitudinal section of tertiary branch of the pulmonary artery in Case VI, a man, aged thirty-three years. *b* represents the longitudinal elastico-muscular layer of the intima, and *d* the elastica externa.

Case XX.—Male, aged seventy-six years. Died of influenza (?). There are plate-like sclerotic and atheromatous patches in the aorta. These show very little fatty degeneration, while the deeper layer of the intima shows large confluent fat masses, a few round cells, and beginning fibrous tissue formation. A fairly well-defined longitudinal elasticomuscular layer is seen. There is no fatty degeneration in the pulmonalis. Both renals show pronounced thickenings in the connective-tissue layer of the intima and some fission of the elastica interna, the latter as well as the contiguous portion of the

media shows slight fatty changes. The intima of the splenic is greatly thickened, its elastica interna split up into several layers and bundles of fibers, with inclusions of connective tissue or muscular cells. In the descending branch of the left coronary there is extensive fatty degeneration of the deep layer of the intima, which is composed of coarse longitudinal elastic fibers and longitudinal muscular cells. The superficial layer is greatly thickened, but not so extensively degenerated. The right coronary is very much the same. There is thickening of the intima in the præfossæ Sylvii, with fission and fibrillation of its elastic elements.

The average age of the above cases was thirty-seven years, the youngest being aged four months and the oldest seventy-six years. Fifteen were males and 5 females. Eight revealed some hypertrophy of the heart, but in only 2 was it at all pronounced. One of these was a case of chronic interstitial nephritis, and the other one of aortic insufficiency. Fourteen, aged on the average fifty-one years, revealed sclerosis or atheroma. The 9 cases which showed fatty spots on the intima were aged on the average thirty-five years, but one or two were infants. All of this latter group either died of infectious diseases or showed definite evidence of past infection, except one, which was a case of primary pulmonary sclerosis with the cause of death unknown. In a number the two conditions were combined.

Eliminating Cases V and VI, the former being syphilitic and the latter primary pulmonary sclerosis, it is worthy of note that no case of sclerosis or atheroma occurred below the thirty-eighth year of life. Considering that these cases were selected from about 300 autopsies, with a view of studying as early sclerotic changes as possible, the proof lies very near, that true sclerosis or atheroma is invariably the expression of involutional or senile changes.

This agrees well with the age at which other senile changes begin to appear, notably, asbestos-like degeneration of the costal cartilages, which is generally recognized as one of the earliest histological manifestations of senility.

Excepting the superficial fatty spots, the changes which I have described as occurring in the intima, before this period of life, are in every sense physiological, and consist chiefly in the thickening of the elastic and muscular elements in the deeper layer of the intima, notably in the aorta, but also to a considerable extent in the other vessels. The slight fissions and lamellations of the elastica interna, with the development of connective or muscular tissue in the intervening spaces, are no wise to be considered the expression of sclerotic changes. They have undoubtedly often been taken for such.

The age at which the physiological development of the vessels is completed varies somewhat with the individual and the vessels concerned. Jores and his pupils, and H. Voigt have worked this out

for the aorta, Smiedel for the mesenteric, and Hallenberger for the radials. Thayer and Fabyan have also shown the gradual thickening of the latter vessel with advancing age.

Ashoff declares that longitudinal muscular bands or layers do not occur in the intima of the smaller vessels except near their point of bifurcation. This is by no menas always the case.

While the results of my studies confirm, in the main, those of Voigt as to the splitting up of the elastica interna of the aorta into two elastic lamellæ and the subsequent laying down of the deeper elasticomuscular layer and a hyperplastic middle layer, I have found that the process does not always proceed with such regularity as his work would suggest.

Younger cases sometimes show the development more pronouncedly than older ones, and occasionally the three definite coats of the intima cannot be made out.

There has been nothing in my cases to suggest that the media plays any part or is in any way altered in the beginning of atherosclerosis. After the process is once well established, hypertrophy of the media occurs, and may, when later impinged upon by the thickened intima, degenerate. The first demonstrable alteration has usually been a thickening of the connective-tissue layer of the intima, and to this, if the condition advances sufficiently, is subsequently added fatty degeneration of the connective-tissue cells, muscular elements, and elastic fibers of the deeper layer of the intima.

The condition is, therefore, primarily hyperplastic, secondarily degenerative, but in no wise inflammatory. I cannot, therefore, agree with Jores that fatty degeneration is the *sine qua non* of sclerosis of the senile type.

If the experiments of Durant, on the effect upon the intima of the destruction of the vasi vasorum and the injection of the lymph channels, as well as those of Bubnoff and Köster on the transportation of cinnabar granules from the surface of the adventitia to the lumen of a ligated segment of a vessel, required further proof of the nutritional dependence of the intima upon the circulation in the vessel wall, the demonstration of capillaries in the intima and the immediately contiguous portion of the media, in Cases II and IV, would certainly be convincing.

In this connection the following recent statement of Adami is somewhat surprising. He says: "The intima is non-vascular, it receives its nourishment by diffusion from the plasma within the aorta, as, indeed, would seem to be the case with the inner layer of the media."

The small cell infiltrations which have occasionally been observed, in and about the fatty spots of the intima have undoubtedly reached their location by means of the lymph and blood circulating in the vessel wall, or else have proliferated, *in situ*, from already existing

cells, and not, as Traub supposed, by a deposition from the blood stream.

CONCLUSIONS. 1. While the elastica interna of most of the vessels at birth consists of a definite single lamella, this is capable of undergoing subsequent fission into two or more lamellæ during the developmental period of life.

Within the first year of life the elastica interna of the aorta shows two definite parallel, closely lying lamellæ, between which a narrow, longitudinal muscular layer has appeared. This latter undergoes a gradual thickening, within which appears a considerable number of rather coarse elastic fibers. The deeper lamella of the two remains throughout life as a distinct limiting layer between the longitudinal elasticomuscular layer and the media. The inner or more superficial one gradually breaks up into a coarse, firm, elastic latticework, enclosing in its meshes a few muscular and connective-tissue cells, which probably are the active factors in the breaking up of this lamella.

The connective tissue, or lumenal layer of the intima, becomes slightly better developed and contains, especially along its lumenal border, a very fine meshwork of delicate elastic fibrillæ.

In such vessels as the iliacs, subclavian, celiac, and sometimes the renals, radial, splenic, and coronaries, fission of the elastica interna, with the deposition of a longitudinal muscular layer or bands, is frequently observed by the fortieth year of life. The time at which this appears varies with the individual and the vessels concerned. It is not always present. They have no doubt frequently been mistaken for sclerotic processes.

2. It is reasonably certain that many of the cells observed in the fissures and clefts of the elastica interna, in the smaller vessels, are muscle cells and occupy an analogous position to the longitudinal muscular layer of the aorta.

3. The fatty spots so commonly observed on the intima bear no actual or causal relation to atherosclerosis. They invariably begin in the superficial layer of the intima and are usually a manifestation of infection.

4. The type of sclerosis here considered is invariably the expression of senility, and very rarely occurs before the fifth decade of life. Its earliest manifestations begin, invariably, in the intima, and are characterized by a hyperplasia of its connective-tissue layer and also its deeper elasticomuscular layer, the latter subsequently undergoing degeneration of both its cellular and elastic elements. It is impossible to say whether the fatty degeneration of the elastic fibers begins in the fibers themselves or in their cement substance.

5. The primary causes of atherosclerosis is an exhaustion of the elasticity of the elastic tissue in the vessel wall, and the hyperplastic changes in the intima are compensatory.

There is no histological evidence of a primary involvement of

any elements in the media, and a fatty degeneration of the elastic fibers of this tunic is very rarely seen.

6. No one has been able to produce atherosclerosis experimentally.

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REVIEWS

DYSPEPSIA: ITS VARIETIES AND TREATMENT. By W. SOLTAU FENWICK, M.D., Doctor of Medicine of the University of Strassburg; Late Physician to the Evelina Hospital for Sick Children, etc. Pp. 485; 10 illustrations. Philadelphia and London: W. B. Saunders Company, 1910.

THIS work is a compilation to a less degree than almost any other work on gastro-intestinal conditions, but rather presents the results of the author's investigations and clinical experience. One commendable feature is the definite statement of the frequency of various symptoms as determined by careful statistical studies of large series of cases. It is to be noted with appreciation that Dr. Fenwick harbors no illusions regarding the accuracy of these statistics. Indeed, in several places he calls attention to the fact that some of the statistics, if gathered in another way, as, for example, in private instead of hospital practice, actually do or probably would show very different results. But at least such statistics provide a starting point that is definite and can only be modified or corrected by further and more careful studies of a similar nature. Once they are published they do away for all time with beliefs, impressions, or opinions. Dr. Cabot has recently laid particular emphasis upon this point.

The book itself is a monograph rather than a text-book. The subject is thoroughly covered, and the reviewer must confess to a slight feeling of surprise when he found included a long section on the chronic gastro-enteritis of infancy. There is, however, no reason, either anatomical, physiological, or pathological, why diseases of the gastro-intestinal tract of infants should be separated from those of adults. On the other hand, the dyspepsias due to ulcer and cancer of the stomach are not discussed, for the excellent reason that the author has considered them elsewhere.

Indigestion is classified into gastric, of which eight types are recognized, and intestinal. This is followed by a tabulation of 1000 cases, and a brief classification of symptoms which constitutes, in a way, a key to diagnosis.

One of the most interesting chapters is that entitled myasthenia gastrica. Dr. Fenwick believes implicitly in the existence of a motor insufficiency and retention without obstruction. There are

interesting tabulations of the age incidence, which, from the difficulty of determining the time of onset of insidious chronic disorders, are not particularly convincing.

The displacements of the stomach are divided into upward, vertical, and total descent. The distinction between the last two is difficult to make.

The chapter on dyspepsia due to the presence of foreign bodies or living creatures in the stomach contains a large amount of curious information.

The section on the chronic gastro-enteritis of infancy is one of the most admirable in the book. Dr. Fenwick believes that even should infants recover, permanent lesions of the gastro-intestinal tract remain in many cases, and his personal studies seem strongly to support this contention.

Only one-tenth of the book is devoted to intestinal indigestion, which is divided into chronic intestinal indigestion, chronic pancreatitis, duodenitis, and enterospasm. Just why the dyspepsia due to chronic pancreatitis should be regarded as an independent form and that due to disease of the liver as secondary is not entirely clear.

One hesitates, however, to find any fault with this book. The subject is so admirably presented, the method of presentation is so original and thorough, that it must be regarded as a valuable contribution to the disorders of digestion. The paragraphs on treatment present very little that is new. Indeed, it may be said that gastro-enterologists agree fairly well regarding therapeutic measures. Three points regarding the arrangement of the book may be noticed. The literary references are conveniently collected at the end and the reader's attention is not distracted by figures in the text. There is, however, no difficulty in discovering any reference that may be desired. The illustrations are few. Each one is apparently carefully selected for a definite purpose. The book is delightfully light, actually weighing just two pounds, which is considerably less than the average of medical books of the same size. J. S.

DAWN OF THE FOURTH ERA IN SURGERY. By ROBERT T. MORRIS, A.M., M.D., Professor of Surgery in the New York Post-Graduate Medical School and Hospital. Pp. 145; 6 illustrations. Philadelphia and London: W. B. Saunders Company, 1910.

THIS collection of reprints from the pen of a ready writer, whose heart always is inditing of a good matter, is a welcome addition to the surgeon's library shelf. They are republished as originally printed, except that "here and there a word has been added for

the same reason that one drops an egg into a pot of coffee, and because of Mark Twain's discovery that the difference between the right word and almost the right word is the difference between lightning and the lightning-bug."

Dr. Morris is nothing if not an extremist, but while he may make us laugh and carry us along with him in some absurd argument to the end of an article, it is rarely difficult, on sober second thought, to detect the fallacy in his reasoning. The usual fallacy is that of the "heap of stones." One is asked if 100 stones make a a heap of stones, and he replies yes; but if we remove 1, will 99 stones still be a heap? Yes, to be sure. And so we go on down the scale, until finally, when the question is asked if 3 stones lying together make a heap, the victim rebels, and says, No, they don't! To this we reply: But you acknowledged that 23 stones, 22 stones, even 18, 17, 16, and 10 stones made a heap; that 9, 8, 7, 6, 5, and 4 stones still made a heap; but when 3 stones alone are left, you say it is no longer a heap—how is that? Of course, as we abstract stone by stone from the heap it must some time cease to be a heap; and Dr. Morris's one failing seems to be an inability to see as soon as others that his "heap" of stones is degenerating into "one or two stones."

In the "Hand of Iron in the Glove of Rubber," "Gall Spider Cases," and "Back to an Old Idea" this tendency is preëminently manifest. But all the papers are interesting, instructive, and well worth the little time it takes to read them, and the longer time required to think them over after they have been read.

A. P. C. A.

INNERE SEKRETION. IHRE PHYSIOLOGISCHEN GRUNDLAGEN UND IHRE BEDEUTUNG FÜR DIE PATHOLOGIE. By PROF. DR. ARTUR BIEDL. Mit einem Vorwort von HOFRAT PROF. DR. R. PALTAUF. Pp. 538. Berlin and Vienna: Urban and Schwarzenberg, 1910.

THIS book, essentially a monographic enlargement of a previously published compendium by the author, presents the collected material in the usual thoroughgoing fashion of the German writers. The work has the distinction, however, of being in the hands of an able investigator, a man of wide experience, a master not only of the literature, but also in command of a splendid first-hand knowledge of the objective side of his subject. The introductory pages by Paltauf fail, however, to give the reader the proper impression of the character of the work, and are in no sense so noteworthy as might be expected from a man of his literary and scientific attainment.

The book itself is divided into two parts. The first part takes

up the general phases of internal secretion, the history, limitations, and definitions, the various forms of hormones, their method of action, their origin, the sources of our knowledge concerning them, and the experimental procedures availed of in gaining our present knowledge of the subject.

The second part, with utmost catholicity, takes up the embryology, anatomy, physiology, and pathology of the various organs and systems of organs concerned in internal secretion. The thyroid (and parathyroid), thymus, adrenal system (chromaffin system), hypothesis, pineal body, and sexual glands are considered in extenso. The pancreas, gastro-intestinal mucosa, and the kidney are considered somewhat less fully, but nevertheless, in a very satisfying manner. This much of the book takes up 407 pages and is followed by an extensive presentation of the literature, occupying 129 pages in small type.

Throughout the book the facts at hand are given precise and careful attention, are presented logically, and with due attention to the methods of demonstration. The writer keeps clearly in mind the difference between proved and unproved, and while not permitting himself to indulge in verbose and vain speculation, yet allows his imagination free play where hypothesis has definite foundation in established fact. The ultimate application of the facts and hypotheses to man is ever prominent, the author giving this phase of the subject most careful attention.

Embryology and anatomy gain little from this book. Physiology profits much by the masterful presentation in compact form of the facts gleaned from wide and diverse sources. Dynamic pathology, however, is given a tremendous impetus by the work, for not only is the pathologist given a broad view of the subject in general, but the book is brimming with suggestion of the application of this sort of physiology to pathological processes, and the thoughtful reader with a mind awake to the vast possibilities of this field of work cannot fail to be stimulated to new endeavor in the search for truth.

The writer gives much due credit to American workers for their share in the development of our knowledge of internal secretions, but unfortunately has been unable to present some of the facts more recently developed in America, a feature too well known in Continental books to need more than passing comment and lasting regret.

The book is printed in large, clean type on smooth, heavy paper, the subject matter being carefully arranged, well paragraphed, and important points usually, but not constantly, printed in heavy-faced type. The work as a whole is of such a high order of merit as to deserve most careful and thoughtful perusal by both clinician and laboratory worker. H. T. K.

PUBLIC HYGIENE. By THOMAS S. BLAIR, M.D. Assisted by numerous contributors. In two volumes; pp. 953; numerous illustrations. Boston: Richard B. Badger, 1911.

DIFFERENT chapters are written wholly or in part by sixteen contributors; the remaining nine chapters, as well as the material added to the chapters contributed by others, are written by Dr. Blair. Besides the collaborators, a number of individuals and organizations are mentioned that have supplied data, reprints, photographs, etc.

The book is divided into twenty-five chapters, as follows: The family versus the community; hotels, lodging houses, and public buildings; school inspection and college sanitation; penal institutions and hospitals for the insane; maternities; places of amusement and dissipation; slums and town nuisances; special rural hygiene and sanitation; state departments and boards of health; a proposed federal bureau of health; local boards of health, county and sanitary officers; army and navy sanitation and hygiene of camps; the coroner and the physician; quarantine; infectious diseases; immunity; epidemics; disinfection; tuberculosis sanitaria and dispensaries; home hygiene and interior sanitary installation and gas installation; pure drugs and foods; public works and corporations; public carriers and sanitation; laboratory methods in sanitation; medical societies and sanitation. In an appendix is given a brief summary of the infectious diseases of animals communicable to man, along with several other matters of minor importance.

The two volumes consist of 953 pages, with numerous half- and full-page photographic illustrations, many of which can convey very little information concerning the public health, and appear to be introduced largely to swell the size of the book and to increase its cost.

Judging from the preface, the editor aims to administer a rebuke to those intrusted with the administration of sanitary affairs and to laboratory men, because, he states, "the decision has been reached that public hygiene has developed too much as a specialty and needs the temperate conclusions of the whole body of the medical profession. Such conclusions must result from a careful comparison of laboratory and clinical data, and no one class of men are so fully qualified to weigh them as is the class to whom this volume is especially addressed.

"But in order to so, the family doctor must inform himself, not only upon the pathological and clinical aspects of the work, but also upon the sociological, legal, and engineering factors involved. The effort is here made to present reliable data upon the present very creditable development of this important subject and, in doing so, the author poses more as an editor than as an original writer, and has endeavored to judicially weigh the evidence at

hand upon a basis of real accomplishment, rather than that of a propaganda."

Altogether the work is a great disappointment in that it fails to give information on important phases of the subject that might be elucidated, and the matter that is given is presented in such a haphazard and jumbled way as to make it altogether unsatisfactory.

D. H. B.

INTRODUCTION TO VERTEBRATE EMBRYOLOGY. By ALBERT MOORE REESE, Professor of Zoölogy in West Virginia University. Second edition, revised and enlarged; pp. 340; 118 illustrations. New York and London: G. P. Putnam's Sons, 1909.

THE book contains a direct and concise account of the more general features of the development of the frog and chick, together with a chapter on mammalian embryology. As the author states in his preface, it is a compilation into convenient form of only the important facts, and is especially suited for those wishing an introduction to the subject. The illustrations are, for the most part, selected from larger and more comprehensive works, and serve as useful adjuncts to the text. In this second edition the enlargement consists of the addition of a chapter of 45 pages on mammalian development, which makes the book more useful, especially for premedical students.

Although no directions are given for laboratory work, it is understood that this is to accompany the study of the text. Indeed, it is only with careful laboratory work that full educational value can be derived from the study of embryology. The study of serial sections of entire embryos is especially valuable in giving the student a plastic imagination.

In following the continuous changes which are occurring during development, it is possible to select only certain well-marked stages for description, but these must be described fully enough to be plainly understood. In such a subject as embryology it is especially true that brevity is not always compatible with clearness. The author has apparently succeeded in choosing the middle path, and with the aid of the illustrations presents a lucid account of his subject.

In the descriptions of the figures, no magnification is given, with the view, perhaps, of not adding a detail which would be useless or confusing. It is probable, however, that the lack of this information often causes considerable uncertainty in the student's mind, and may be even misleading, especially as in the present case where the figures come from diverse sources.

The fact that a second edition has been called for shows that the book has been found useful, and is also a hopeful sign that the value of the study of embryology is being appreciated. W. H. F. A.

CHEMISTRY OF FOOD AND NUTRITION, By HENRY C. SHERMAN, Ph.D., Professor in Columbia College. Pp. 355. New York: The Macmillan Company, 1911.

THE number of books pertaining to the chemistry of foodstuffs is legion, and it would seem that with library shelves groaning under the weight of treatises on food and nutrition, the *furor scribendi*, which is epidemic at present, should be held somewhat in check. In a way these multitudinous books have a purpose quite apart from their table of contents. They are blazing a trail through a subject which, in America, at any rate, has been woefully ignored, and are atracting attention to a field of science which is so near to medicine that it has been overlooked by the hyperopic vision of most physicians. This purpose is commendable, but it may be defeated by the almost infinite number of books devoted to this study, since the searcher for knowledge of the subject stands aghast at the outset of his quest by the rows upon rows of imposing volumes. In his dismay he feels that to choose one work from so many is beyond his ken, and flees the task.

The book under review is a concise, well-written, and extremely accurate exposition of the subject with which it deals. The chemistry of foods themselves is contained in a rather short chapter, but broad enough in scope to give a clear idea of general principles. The remainder of the work is devoted to food in its nutritive relations, that is, the action of ferments, the course of the food through the digestive tract and its fate, the food requirements of the body, both organic and inorganic, with a complete table of the protein, fat and carbohydrate content of foods and their fuel value. The book comprises only about 350 pages, but in these the author has given more than a glimpse of the subject, and offers his reading matter in a well-prepared, easily, and pleasantly assimilable form.

E. H. G.

A MANUAL OF PHYSICAL DIAGNOSIS. By BRESNEY R. O'REILLY, M.D., C.M., Demonstrator in Clinical Medicine and Pathology, University of Toronto; Assistant Physician to St. Michael's Hospital, Toronto. Pp. 369; 6 plates and 49 illustrations. Philadelphia: P. Blakiston's Son & Co., 1911.

THE author of this epitome of physical diagnosis has brought out a book which should be of especial value to the student. He deals with his subject in a thorough and careful manner. His explanations and descriptions, while concise and brief, are yet so clear that they can be readily understood by the beginner in the study of this subject. The book will also prove useful to the prac-

titioner and teacher. Many of the signs of physical diagnosis, named after the original describer, are easily forgotten and with difficulty sought out, here may be found the complete summary of of all these signs, easy to reach and to rapidly review.

A few criticisms of the author's style and handling of his subject matter may be made. There is a splendid epitome of the polygraph with complete interpretations of the graphic tracings produced, but unfortunately, the author has seen fit to dismiss sphygmomanometry with but a few lines. The addition of the appendix seems to be unnecessary. Clinical laboratory methods are much better left to the larger works on this subject. In the explanations of the methods of laboratory procedure, there is a tendency to be too brief, so that they are of little value except for the seasoned laboratory man. As an example of excessive brevity, we find no mention of the use of glacial acetic acid in the benzidine test for occult blood.

While a few other minor criticisms might be made, in its entirety the book is a clean cut, complete exposition of an important subject. J. H. M., JR.

MANUAL OF CYSTOSCOPY. By J. BENTLEY SQUIER, M.D., Professor of Genito-urinary Surgery, New York Post-Graduate Medical School and Hospital and HENRY G. BUGBEE, M.D., Instructor in Genito-urinary Surgery, New York Post-Graduate Medical School and Hospital. Pp. 117; 26 illustrations. New York: Paul B. Hoeber, 1911.

THIS small volume has been prepared to meet the demands of students for a short, practical work on cystoscopy. With this object in view, the authors have eliminated detail, confining themselves to a concise but clear description of cystoscopic technique, normal as well as pathological bladder pictures and ureteral catheterization. The illustrations are unusually well executed and in several instances schemtatic drawings are included to further elucidate the colored plates. The book can be highly recommended to the beginner in this line of work. F. E. K.

RADIUM. ITS PHYSICS AND THERAPEUTICS. By DAWSON TURNER, B.A., M.D., F.R.C.P., (Edin.) M.R.C.P. (Lond.), F.R.S. (Edin.), Lecturer on Medical Physics, Surgeons' Hall, Edinburgh, etc. Pp. 86; 27 illustrations. New York: William Wood & Co., 1911.

THE author's objects in presenting this publication are: (1) To give, in a concise form, to those of the medical profession inter-

ested in the subject, but unfamiliar with it, a brief outline of the discoveries, investigations, and published works of physicists of the highest recognized authority along the line of radioactivity. (2) To explain briefly the physiologic action, therapeutic effects, and therapeutic applications of radium, and the methods of employing it as a therapeutic agent. (3) To show the results in general that have followed its use, and the results of the author's own experience in radiotherapy during a period of five years. This book would be found especially valuable to anyone unfamiliar with the subject who might wish to obtain a general idea of any part or all of it in a comparatively short time. H. K. P.

GYNECOLOGICAL THERAPEUTICS. By S. JERVOIS AARONS, M.D. (Edin.), M.R.C.P. (Lond.), Gynecologist to St. Anthony's Hospital; Fellow of the Royal Society of Medicine, Member of Obstetric and Gynecologic Sections; Formerly Registrar and Pathologist to the Hospital for Women, Soho Square; Gynecological Tutor, Extra-mural School of Medicine, Edinburgh; House-surgeon, Gynecological Ward, Royal Infirmary, Edinburgh. With foreword by SIR HALLIDAY CROOM, M.D., F.R.C.P., F.R.C.S., Professor of Midwifery in the University of Edinburgh. Pp. 178; 43 illustrations. New York: William Wood & Co., 1910.

THIS book of 178 pages deals solely with the medical treatment of gynecological affections. The author has taken up the various lesions in a systematic manner, and briefly but clearly outlines measures which his own experience has proved of value. Numerous prescriptions are included as well as definite instructions concerning local applications and the use of pessaries. The book presents a comprehensive review of modern gynecological therapeutics and will be of distinct service to the general practitioner for whom it is intended. F. E. K.

VICIOUS CIRCLES IN DISEASE. By JAMIESON B. HENRY, M.A., M.D., Ex-President, Reading Pathological Society. Pp. 186; 10 pages illustrative diagrams. Philadelphia: P. Blakiston's Son & Co., 1911.

THIS little monograph is a distinctly novel and interesting contribution to medical literature, and one is at once impressed by

the large number of vicious circles the author is able to cite, to the authenticity of which most readers can testify from their own experience. From the publishers' standpoint, the book is attractively bound in cloth, printed on heavy paper and in large type, this feature being especially commended.

After a short introduction, in which the important part that vicious circles play in pathology is sufficiently emphasized, the author divides his subject matter into twelve chapters, dealing respectively with the classification of circles, which he divides into organic, mechanical, infective, neurotic, etc., circles associated with the nervous system, and in order, circles associated with the cardiovascular system, the respiratory system, the digestive system, the urinary system, the sexual system, with the eyes and eyelids. Then folllows an interesting chapter devoted to artificial circles, not caused by, but leading to disease, such as excessive purgation, excessive abuse of alcohol, tobacco, morphine, the use of strychnine in shock, the use of restraint in the case of the insane, etc. Next a chapter entitled The Genesis of the Circle, in which is discussed various pathological conditions giving rise to circles; then a chapter devoted to the discussion of the breaking of the circle, first by natural means, and secondly by treatment, in the latter case emphasizing the importance of breaking the circle at its weakest point and finally the author states his conclusions.

The one criticism advanced, if criticism it be, lies in the rather too frequent use of Greek, Latin, and French quotations and ex-extracts to illustrate and reënforce the author's meaning.

V. L.

PROGRESS

OF

MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

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Gastric Analysis.—BENTON and TIDY (*Quart. Jour. Med.*, 1911, iv, 449) studied 331 test meals of toast and tea at the London Hospital. In cases of gastric carcinoma Günsberg's reagent gave a negative test and the total acidity was highest when the lesion was at the pyloric end. With a low acidity, it was either in the cardia or in the body of the stomach and inoperable. Taken in connection with the length of history given by the patient, the gastric analysis is of some importance. A patient with carcinoma and a gastric history of less than two years almost certainly has no free HCl in the test meal. One with a gastric history of more than four years and no free HCl almost certainly has no carcinoma. In the rare cases of carcinoma grafted on an old ulcer there was generally presence of free HCl and the total acidity was normal or above. Thus, the picture resembles the ulcer type. In the cases of ulcer it was observed that marked anemia may lead to a diminution of the free HCl. Especially is this the case after severe hemorrhage. And it is noteworthy that free hemorrhage may lead to an amelioration of the symptoms. Dyspeptic cases with low acidity early lost their symptoms on the administration of acids. This furnished a good clinical differentiation from carcinoma, where the acidity is usually unchanged and the symptoms unmodified. In dealing with free acidity they found Günsberg's reagent of much greater importance than the dimethylamidoazobenzene. The methods generally in use are approximately accurate when the free acidity is normal or above normal, and not so accurate when it is below, while the phosphates which are secreted into the stomach when the mucous membrane fails

to elaborate HCl detract from the accuracy of ordinary methods. This inaccuracy is common to all methods. Therefore, the simple Günsberg reaction with estimation of dimethyl acidity and total acidity by phenolphthalein are quite sufficient.

Cultivation of Treponema Pallidum.—While several investigators have produced a spirochete morphologically the pallidum, this parasite has never yet been grown to reproduce syphilitic lesions. NOGUCHI (*Jour. Amer. Med. Assoc.*, 1911, lvii, 102) using the testicular tissue of rabbits, grew the treponema upon serum water to which sterile rabbit kidney or liver had been added. At first strict anaërobic conditions are necessary. As the cultures contained bacteria too, Noguchi was able to effect purification by letting them grow through a Berkefeld filter, which held back the bacteria. Later they may be recovered from the bacteria from stab cultures in solid media. Their pathogenicity for rabbits has been proved, and the same lesions are found as in those set up by inoculation with luetic material. This establishes the fact that the treponema is the cause of the lesions in man.

Effects upon Complement Fixation Test of Arsenobenzol.—CRAIG (*Arch. Int. Med.*, 1911, viii, 395) has studied 225 cases out of over 700 at his disposal. The histories of these selected men were full as to date of infection, stage of the disease, and immediate results of treatment. The best results of treatment are with cases in the primary stage of the disease—the worst with tertiary manifestations—but the complement fixation test disappears more rapidly in the tertiary stage cases. The explanation of this is that a positive test means the presence of living spirochetes, and whereas in the primary stage there were a large number of spirochetes in the patient, in almost all tertiary cases the patient had had courses of mercury and the organisms were readily killed off. This observation of the rapid disappearance of the complement fixation test in the tertiary stage coincides with the clinical observations where one observes rapid healing of tertiaries following salvarsan. In most cases the reaction disappeared in the second, third, and fourth weeks of treatment. The prognosis is most favorable with those cases showing a weak fixation, and least favorable with the cases showing a strong (100 per cent.) fixation. They tried very few cases with the intravenous method. Alkaline suspensions were better than neutral when used intramuscularly, and the reaction disappeared faster after intravenous than intramuscular injection. While the time of disappearance of the reaction was little affected, better results were obtained in those cases who had mercurial treatment. One or two injections of "606" seemed more efficacious than two years of mercury. The reaction furnishes the only test of whether lues is cured or not, and one must wait a reasonable time to get the reaction.

The Physiology of Passive Movements.—VEIEL and ZAHN (*Münch. med. Woch.*, 1911, lviii, 1759). While passive movement has been used for some time in the therapy of cardiac disease, there has been as yet no accurate observation of the exact effects upon the system.

Recently Veiel and Zahn have been able to conduct such experiments in Romberg's clinic with Büdingen's apparatus. This consists of an electrically driven machine, by means of which the legs of patients can be put through the motions of ordinary walking and hill climbing. Two arms are operated by the mechanism, to each of which a leg is fastened. The speed and length of stride can be altered at will. They found that these passive movements produced a greater flow of blood in the legs, the flow in the arms being less in compensation. The striking force of the heart is greater. The circulation is influenced in the same way, but in a milder degree than in active movements. There is no general rise in blood pressure as is seen in active movements, and the heart acceleration is absent. The exercises are particularly useful in bedridden patients, preventing marantic thrombi because of blood stasis. They are particularly indicated in cases of mild or medium grades of cardiac insufficiency, where it is essential to improve the peripheral circulation, and at the same time give mild exercise to the heart. The exercises are of the same sphere of usefulness as CO_2 baths and massage.

The Excretion of Uric Acid by the Kidney.—Frank and Bauch (*Berlin. klin. Woch.*, 1911, xlviii, 1463) investigated clinically the effect of atophon (2 phenylchinolin, 4 carbon acid, supposed to be a remedy for gout) on the excretion of uric acid. The patients were on purin free diet and were of the gouty diatheses. Uric acid given intravenously was always followed by a more considerable output of uric acid if atophon had also been administered. It is very probable that atophon changed over the uric acid into an easily soluble component. From their observations they conclude that the teaching of an interrupted or more difficult uric acid excretion is not far wrong as a cause of gout. They feel that Brugsch and Schillenhelm's hypothesis, that the uricolytic ferments are at fault, is wrong, because when one can recover almost quantitatively uric acid introduced intravenously, there would not be time for these ferments to work. It is more probable that gout depends on a difficult excretion of uric acid by the kidneys. But it is improbable that this is part and parcel of either an anatomical function or a renal insufficiency. It is probable that the difficulty in excretion depends on a definite decrease in individual cell power, some cells being especially reserved for the excretion of each urinary component. Most, but not all of the uric acid is excreted by the tubuli contorti. As these cells are damaged this selective action disappears and the acid is excreted from other parts of the kidney. Atophon has seemed the key to raise the damaged cells to their old stage of usefulness.

Salvarsan in Late Lues of the Nervous System.—Assman (*Deut. med. Woch.*, 1911, xxxvii, 1603) has investigated 8 cases of general paralysis with 6 of tabes dorsalis and several of syphilitic nervous system diseases. The "606" was given in various ways, sometimes intramuscularly, but generally intravenously, in small, repeated doses. In six weeks' observation on paralysis of the insane there was a general improvement of the condition either observable clinically or by the

Wassermann reaction or by the character of the spinal fluid. In some cases of tabes there was improvement of the lancinating pains and gastric crises, but never an improvement of the objective nervous phenomena. Generally there was slight change in the character of the cerebrospinal fluid lymphocytosis (Nonnes reaction), but in 2 cases this improvement was very marked. The Wassermann reaction in the blood and spinal fluid was not influenced. In lues of the cerebrospinal system not only the clinical symptoms but also the cerebrospinal fluid was much improved in all its characters.

The Nitrogen and Chloride Excretion by the Skin.—Loofs (*Deut. Arch. f. klin. Med.*, 1911, ciii, 563). The amount of nitrogen and chloride excreted by the skin is interesting, for in cases of renal insufficiency all authorities from von Ziemsen have advocated improving elimination by vigorous stimulation of the skin and bowels. Loofs studied the amount of nitrogen and chloride excreted into clean absorbent towels by patients in various stages of nephritis. Three cases of tuberculosis were used as controls. In no case was there any increase in the amount of nitrogen or chloride excreted by the skin of nephritic patients, even in 2 cases where well-defined uremic symptoms were present. About 0.25 gram nitrogen and 0.2 gram sodium chloride were excreted in twenty-four hours. In 1 case of acute hemorrhagic nephritis the sodium chloride output was about doubled, but this patient was just recovering from edema.

Spectroscopy in Fecal Examination.—Csepai (*Deut. Arch. f. klin. Med.*, 1911, ciii, 459) compares the relative accuracy of investigation of feces and gastric contents for blood. He finds that the most sensitive test is the benzidin, which depends on the catalytic action of benzidin and hydrogen peroxide. The old crystallization of hematin tests have been abandoned because of their lack of sensitiveness. The catalysis tests are not as good as one could wish, because they react to plant chlorophyll and other bodies and because the reagent readily spoils. He recommends a spectroscopic test. The instrument used may be of the cheapest variety; 5 c.c. each of concentrated acetic acid, alcohol, and ether are rubbed up for a few minutes into about 5 grams of feces, then filtered through a dry paper. To this extract in a test-tube 1 to 2 c.c. of pyridin and 1 to 3 drops of ammonium sulphide are added. The resulting mixture in the presence of blood shows the spectrum of hemochromogen. The patient should, of course, be on a hemoglobin and chlorophyl free diet for about three days before the test, *i. e.*, he should have no meat or green vegetables. The test must be done immediately after the addition of the ammonium sulphide, for delay causes weakening of the absorption spectrum.

The Action of the Vagus on the Human Heart.—Robinson and Draper (*Jour. Exper. Med.*, 1911, xiv, 217). While it has been possible to show the accurate effects of mechanical vagus stimulation upon the heart of lower animals, it is only recently with the aid of the electrocardiograph that it has been possible to do this in man. In a normal man, Robinson and Draper produced slowing of both auricles

and ventricles and delay in the A-C time, and probably the left ventricle was diminished in force of contraction. Stimulation of the right vagus has more effect on the heart rate and force of ventricular contraction than the left, but the left has more influence on the conductivity from auricle to ventricle. Right-sided stimulation increased the action current of the ventricles, *i. e.*, there was a bigger "R" wave, while the left vagus produced an opposite effect. There was no difference in the current of auricular contraction, nor were any changes in excitability of auricle or ventricle produced. In cases of auricular fibrillation, stimulation of the right vagus caused slowing or stopping of the ventricular rhythm with no effect upon the electrocardiographic register of the auricular fibrillation. While the effect of vagus stimulation on fibrillating auricles in animals is still unsettled, it is probable that it is an apparent arrest and is in reality due to the powerful depression of the force of auricular contraction. No one would venture to so powerfully stimulate the vagus in man in the light of Quincke's advice. In all probability these pauses might be due to blocking of the auricular stimuli. After vagus stimulation the force of ventricular systole is much weakened for several beats. The excitability of the ventricles may be lowered, although there is no change in the auricles.

Animal Experiments in Goitre.—GOUGET (*Presse Médical*, 1911, 709). The idea that the endemic development of goitre is due to the water drunk is not new, and always has been favorably received. Goitre is seen in the endemic districts in most domestic animals, of which the dog and rat are the most sensitive. Of 8 rats, 6 had pronounced goitre after drinking water when put in a Swiss goitrous district. The other 2 were young and escaped, for generally the malady attacks only adults. In the control animals who drank other waters but were housed and fed the same, there were no cases. In the test animals 50 per cent. of the young were stillborn and many others died early in life. Simple Berkefeld filtration does not protect the animal. Hence the exciting cause may be an ultramicroscopic organism or a soluble toxin. The filter was kept in milk and the milk given for over a year off the filter. There was no case of goitre among the animals, but a definite cretinoid state. Gouget finished by producing less marked goitres by the filtrates. All the goitrous animals had big hearts, not, he thought, due to the goitre, but both from one cause. Heating water apparently destroyed the causative agent. This agent was apparently derived from rocks over which the water ran, not only because of the richness of the water in lime salts, magnesium, and iodine contents, but also because of other properties. Gouget accordingly left ineffective water in contact with rocks from the streams of the goitrous areas. None of the animals using this water developed goitre except after long periods. Contrarily, he put struma-producing water in contact with jurassic rocks, and no goitre was produced in the animals taking it. It thus appeared that the goitrous toxin was fixed by some rocks, *i. e.*, the rocks lose their efficacy just like the filter. The presence of colloid in goitre led him to try dialysis. The dialyzed portion gave no goitre to animals. The water remaining in the dialyzer produced it readily. By the stalagmometer he found differences in surface ten-

sion of the dialyzed and remaining fluid, *i. e.*, the substance is colloidal. This harmonizes well with the lack of stability in transportation and heating. Repin has discovered that heat does not destroy the agent and that the diminution in struma producing qualities is proportional to the precipitation of the calcium salts; others that it is proportional to the poverty of the iodine salts. Beratch and Lesieur are accordingly precipitating iodine salts and observing results. These surely look hopeful.

Acid Intoxication in Diabetic Coma and other Diseases.—Porges (*Wien. klin. Woch.*, 1911, xxiv, 1147) reviews the various acids in coma diabeticum as well as the various forms and causes of other intoxications. The poisoning may be due to over accumulation of acids, to a deficiency of alkalies, or to an insufficient output of acids to which the condition is due. Acidosis is much more common than is generally supposed. It is characterized invariably by increased breathing and this may be a greater intake of breath at each respiration —hyperpnea—or an increase of the respiration. Lately it has become known that the respiratory centre is particularly sensitive to acids, and that the respiration is a means of throwing off the excess of acid in the blood. This acid is mainly carbonic acid. On finding a patient in coma where no history can be obtained, with nothing to explain the coma on physical examination, hyperpnea denotes that the condition is one of acid intoxication. In this condition, alkalies are indicated. On the contrary, the absence of excessive action of the lungs serves to exclude acidosis from diabetes or other cause. Meat and other proteins should in such a case be excluded from the diet. While they do not actually cause acidosis, they surely tend to increase it, and should be kept down in cases of nephritis and diabetes that show any tendency to become comatose. But under ordinary circumstances the organism is able to dispose of the acid elements of meat. Balint (*Berlin. klin. Woch.*, 1911, xlviii, 1580) advises the administration of sugar solution per rectum in those cases due to diabetes. The absorption is better and longer. By mouth the patient receives only 500 c.c. of bouillon, but this in addition to the 100 or 200 grams of sugar in the infusion gives him 700 to 800 calories per diem. Under this treatment the acid intoxication was materially reduced or even disappeared, and the reduction was proportional to the time that the rectal infusion was kept up. This reduction in acetonuria kept up for some time, and in addition the glycosuria was diminished. The sugar given by rectum may be better used because it goes at once into the general circulation instead of by way of the portal vein.

SURGERY

UNDER THE CHARGE OF

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Tincture of Iodine in the Treatment of Surgical Tuberculosis.—FRANKE (*Zentralbl. f. Chir.*, 1911, xxxviii, 953) says that this use of the tincture of iodine has not been recognized in surgery. In every operation on surgical tuberculosis in which the diseased focus is opened, there is always the danger of infecting the sound tissue with the tubercle bacillus. This applies particularly to suppurative bone and joint disease. Various efforts have been made to overcome this danger. Phelps and v. Bruns filled the wound cavity with pure carbolic acid and washed out the excess with alcohol. Burning with the Paquelin cautery or with boiled oil has been employed, and Sprengel has rubbed iodoform and calomel into the wound. Franke during the last nine or ten years has been employing tincture of iodine for disinfection of the wound after operations for bone tuberculosis, and more frequently for tuberculosis of the soft tissues. After chiselling and curetting away the tuberculous focus, or after excising a joint, he stops the hemorrhage as carefully as possible by tampon, ligation, or torsion of the vessels, and then applies over the whole wound surface strong tincture of iodine. He fills the cavity with it and then withdraws it after one or two minutes, with a syringe. In small wounds he uses merely a piece of gauze for the purpose. In some cases he drains with a rubber tube, and in others he closes the skin wound completely, trying to obtain healing by means of the blood clot. This was not always successful. He has not seen any disadvantages from the use of this method, except in one case, in which a sequestrum of bone led to the formation of a fistula of long duration. Healing by first intention is not prevented by the use of tincture of iodine in bone tuberculosis and is rather favored in soft tissue involvement, especially when the application of the iodine is long continued and the effect is intense. This is because the later hemorrhage is not so severe from the soft tissues as from bone. The hemorrhage has the virtue that it counteracts a too strong effect of the tincture of iodine, which has itself a hemostatic effect.

The New Ruggi Operation of Making a Double Opening between the Stomach and Jejunum by a Gastro-enterostomy.—ROCCHI and STOPPATO (*Zentralbl. f. Chir.*, 1911, xxxviii, 955) say that Ruggi teaches

and performs the operation of making a double communication between the stomach and jejunum, usually on the posterior wall of the stomach, but does not exclude the Wölfler operation of making the openings in the anterior wall. The object of the double opening is to prevent the development of a vicious circle. With this method one can make a free communication between the stomach and jejunum and can make an extensive application of the serous surface of the one to that of the other. Each opening is 3 to 5 cm. long and they are separated from each other by about 2 cm. The proximal opening may be placed in a vertical direction, as Richard-Cheuvrier, Moynihan, and Kausch recommended, and the distal opening in a transverse direction, parallel to the greater curvature of the stomach. Ruggi usually places both openings in the transverse direction.

Perforated Gastric Ulcer and its Relation to the Neutrophilic Leukocytes.—MANNHEIMER (*Mitt. a. d. Grenzegeb. d. med. u. Chir.*, 1911, xxiii, 553) says that the inflammatory leukocytosis in a perforating gastric ulcer case, in the beginning as well as in the further course of the disease, shows a changing picture. It is an apparently irregular, at any rate not so clear a picture as occurs in appendicitis, which is an inflammatory process from the beginning. This changing relation is explained as follows: The leukocytosis first appears with the participation of the peritoneum in the inflammation. Often, however, after a gastric perforation the inflammation is mild. The perforation may take place into the free peritoneal cavity, but the infection soon localizes itself to a portion of the cavity with the development of an encapsulated abscess. According to the varying virulence of the infection the process extends more or less widely and the stomach contents is extravasated into the abdomen. All these have a very variable influence on the blood picture, so that it assumes a special importance and may be a valuable aid in determining the character of the infection. The diagnosis of a perforating gastric ulcer is often much less dependent upon the symptoms of peritonitis than upon the other symptoms. With the establishment of the diagnosis operation is indicated. The inflammatory leukocytosis is of value for the prognosis in the beginning, but more especially in the further course of the disease. Here the leukocyte blood curve is of value. It gives information concerning the increase and decrease of the virulence of the inflammation and concerning the resistance of the body. It is also an important guide for treatment. The inflammatory leukocytosis deserves the consideration in connection with perforation of the stomach that is given to it in many other conditions.

Leverage Extension.—DEUTSCHLANDER (*Zentralbl. f. Chir.*, 1911, p. 1053) says that the method of nail extension in fractures has been employed for the purpose of traction only as its name implies. There are many forms of fracture in which the strongest traction will not reduce the deformity. In these it has been necessary to use leverage, torsion, and lateral traction. Whenever the fragment offers a suitable place for the application of a combined traction, which is the rule in diaphyseal fractures, its employment offers no difficulties, and it may obviate the necessity of an open operation in some cases. By

placing a nail in both fragments, a firm hold of each is obtained and a direct correcting pull may be exerted on both. By inserting a lever between the two nails a powerful leverage effect can be obtained. After proper preparation of the fracture region, and with local or general anesthesia, a good nickel-plated steel nail can be driven into each fragment. A dressing should then be applied, the heads of the nails being permitted to protrude beyond the dressing. Longitudinal traction is applied directly to the distal fragment. A lever is inserted between the two nails. The form of lever employed by Deutschlander is illustrated. It consists of a simple rod, bent downward like a hook, where it grasps the distal nail from above, to prevent sliding, and passing backward under the proximal nail to curve upward in a half circle, where it ends. Traction by rope and pulley is made from the free upper end of the curved rod on the proximal fragment, and, as already stated, directly from the nail in the distal fragment. The effect is to turn the fragments in the desired directions, and thus to correct the deformity. If the nails are made to perforate the fragments, the same apparatus may be applied on both sides. This method was employed in the case of a fracture of the lower end of the radius, of thirteen weeks' duration. Firm union had taken place with the lower fragment completely displaced on the dorsum of the radius and turned about 90 degrees on its axis so that the wrist-joint surface looked obliquely upward. Marked ankylosis of the wrist-joint, with very little flexion and extension and no rotation, were present, and there were severe sensory disturbances from pressure of the nerves over the fragments. Under vein anesthesia the fragments were separated with a periosteal elevator, and the leverage extension was applied. After twelve days the nails were removed and the deformity had been reduced. Ordinary treatment with massage and passive movements was followed by almost complete return of motion with disappearance of the sensory disturbances.

The Ejaculatory Ducts in Hypertrophy of the Prostate and the Sexual Functions after Freyer's Prostatectomy.—Legueu and Papin (*Ann. d. mal. d. org. gén.-urin.*, 1911, ii, 1249 and 1356) present a study of this subject and report nine operations for this condition. In summarizing the results they say that in only 1 case was erection suppressed completely, and very slightly in another. Erection was normal and the sexual relations were performed in the other cases, but there was ejaculation to the exterior in only 3 cases. Suppression of the sexual appetite occurs only in the old and very feeble subjects. Erection appears to be preserved in the great majority of cases. The suppression of ejaculation is explained by the fact that in many cases the ejaculatory canals are broken. It therefore results that the orifice in the prostatic cavity is contracted, deformed, and may be obliterated, so that there may be retention of the spermatic fluid. It is probable that in many cases in which ejaculation of the fluid to the exterior does not occur, it takes place into the bladder. This ought to be especially true in those cases where there is rupture of the ejaculatory ducts, the orifices of which open into the prostatic cavity, the latter forming a portion of the bladder. External ejaculation requires the preservation of the verumontanum, which is a part of the floor of

the prostatic urethra. The organism is preserved which contributes to make us believe that ejaculation occurs internally. These facts agree perfectly with what we know of the surgical anatomy of prostatic hypertrophy. The operation is performed entirely internal to the urethra and the nerves of the genital function are not disturbed. A certain number of the patients asserted that they had somewhat recovered their youthfulness. It is very plausible that the removal of an adenoma which has been compressing the ejaculatory canals, the seminal vesicles, and prostate, may give to the sexual functions renewed vigor. There still remains enough of the accessory genital glands to produce the emulsifying fluid for the testicular secretion. What is more astonishing is, that the ejaculation may occur externally.

The Surgical Treatment of Pulsating Exophthalmos due to Arteriovenous Aneurysm between the Internal Carotid and Cavernous Sinus. A New Method.—ZELLER (*Deut. Ztschr. f. Chir.*, 1911, cxi, 1) says that the common carotid on the side of the wounded internal carotid and cavernous sinus should be compressed systematically in an effort at curing the aneurysm and especially as a preliminary to ligation of the common carotid. As a result of the compression the collateral circulation will be improved, the heart will become accustomed to the greater work put upon it, and a test will have been made as to whether the patient can tolerate the shutting off of the carotid current. If brain disturbances occur after continued compression treatment, then the ligation of the common carotid is contraindicated. If success does not follow the compression treatment, the internal carotid on the side of the aneurysm should be ligated as near as possible to the base of the skull in two places and divided between. Ligation of the external carotid does not protect against recurrence, but interferes with the blood supply of the eye in case the ophthalmic artery is occluded, and therefore, should not be done. Depressing and cachectic conditions of any kind require preliminary supporting treatment, a failing heart being strengthened as much as possible. In patients of this kind, aged over forty years, ligation should be limited to the most severe cases and is only then to be permitted after systematic compression if the common carotid is found to give rise to no brain disturbances. In strong young people and in children, the ligation is to be done, as a rule, under local anesthesia. In idiopathic exophthalmos, in old people, and when arteriosclerosis is demonstrable or supposed to be present, and in traumatic exophthalmos, the systematic compression of the common carotid and careful performance of the ligation is of special importance. If, after long-continued compression of the carotid, no brain disturbances arise, careful ligation in spite of old age, is permissible. Threatening dangers after ligation are to be combatted with heart stimulation. Phlebotomy may be tried for the relief of the heart. In recurrence of the aneurysm after ligation, in mild, unilateral cases, especially when compression of the aneurysmal ophthalmic vein causes the noise to cease, excision of the same may be tried, but it is to be borne in mind that healing can occur only by the undesirable thrombosis of the cavernous sinus. In severe cases, in the bilateral variety with high grade disturbances of sight and torturing conditions, besides the ligation of the internal carotid in the neck,

intracranial ligation of the internal carotid should be done, and if possible proximal to the giving off of the ophthalmic artery. The patient should be strengthened as much as possible. Narcosis is necessary, and the operation is to be performed with as little loss of blood as possible. The operation itself is severe, but there is no danger on the side of the circulation of the brain. If the ligature can be placed only distal to the ophthalmic artery, then after the ligature is applied, the next lying portion of the ophthalmic artery should be destroyed by crushing. The ligation of the second carotid is to be strictly avoided, since experience has shown that it is especially dangerous, and upon anatomical and physiological grounds can have no healing effect.

Investigations Concerning Fat Embolism.—GROENDAHL (*Deut. Ztschr. f. Chir.*, 1911, cxi, 56), after a thorough study of the subject, says concerning the treatment that the prophylaxis of fat embolism from the usual bone injuries is based upon the fact that it is especially liable to occur during or after a severe transportation. The prophylaxis, therefore, should consist in the avoidance of long transportation, changing of the dressings during the first few days, and any massage. In connection with orthopedic operations the therapeutic measures are different. Here the conditions causing the fat embolism are osteoporosis and atrophy of the inactive bone. Bruising and pressing of the bones together should be avoided as much as possible. It will probably be useful to loosen up the Esmarch bandage slowly. This agrees with animal experimentation, since the animals can tolerate much more fat when it reaches the lungs slowly. A scientific therapeutic effort is that performed by Wilms in one case with success. He made a fistula in the thoracic duct upon the theory that the fat reached the lungs through the lymph paths. Later investigations by Fritz corroborated Wilm's idea. He showed in animals that through the fistula much fat escaped in large drops after bone injuries. The operation is, therefore, justified theoretically. It may be performed in cases where severe brain disturbances are present. It is known that cases with very severe brain disturbances may get well. The dangers of the operation are relatively slight, and the permanent thoracic fistula can be obliterated. Where beginning symptoms of fat embolism can be diagnosticated, the operation should be performed as quickly as possible.

Experimental Investigations Concerning Extradural Anesthesia.—LAWEN AND VON GAZA (*Deut. Ztschr. f. Chir.*, 1911) say that the dose of novokain (0.03 gm. per animal kilogram) which by intradural injection causes the death of the animal, by extradural application causes no change in the blood pressure or only a transitory increase, never, however, a marked lowering of the blood pressure. Changes in breathing or of the corneal reflexes were not observed. The same dose of novokain (0.1 gm. per animal kilogram) which by intramuscular injection, caused no change in the blood pressure, breathing, or corneal reflexes, by extradural injection caused marked lowering of the blood pressure, cessation of the respiration and death of the animal. The toxic dose of the anesthetic by extradural injection had a considerably deeper effect than by intramuscular injection. The associated disturbances from extradural novokain injections are due to the rapid

absorption by filtration, which is aided by the increased pressure in the extradural space. The addition of adrenalin does not prevent these by-effects. They may be prevented by making the extradural injection as slowly as possible. These experimental observations agree throughout with the clinical findings. In the Leipzig clinic the extradural anesthesia is now obtained by injecting the necessary amount of novokain bicarbonate very slowly, taking from one to two minutes to complete it.

Surgical Treatment of Fistula in Ano without Mutilation of the Sphincter.—MacKenzie (*Annals of Surgery*, 1911, liv, 360) treated by the following operation two old cases of fistula in ano, one of forty-six and the other of four years' duration, with success. In the former case, many operations and in the latter, two or three, had been previously done without success. The patient is prepared in the most careful way as for any major operation on these parts. The sphincter is completely dilated. The internal orifice of the fistula is minutely examined and with a proper instrument is cautiously dilated. After dilatation, the mucosa is uplifted and pared with a curved scissors in the direction of the long axis of the bowel, and with a small knife or fine scissors the circumference of the muscular layer is then trimmed and vivified. If need be, the opening may be incised or split in the direction of the circumference of the sphincter. After this has been done a few interrupted sutures of iodized catgut are introduced in the muscular layer at right angles with the sphincter, tied, and divided. The mucous membrane is then sutured with interrupted chromic catgut or silk sutures, properly spaced. If more than one orifice exists, of course, the same procedure is followed. A flap is made on the side involved, beginning by making a small semilunar incision just beyond the border of the external sphincter, dividing the parts down to the fistulous tract, the latter being divided flush at its point of emergence from the bowel. The incision is extended from both ends of the first incision outward and made large and deep enough to include, if possible under the eye, all visible and accessible branching tracts. The exigencies of the case may require sometimes the lifting of one or the other of the buttocks in its entirety. In one case it was necessary to make a complete and partial resection of both buttocks in order to reach the deepest and most distant branching tracts. The opposite side of the rectal opening is now attacked, and after all doubtful tissues have been removed the rectal wall is infolded once or twice over the line of sutures within. The greatest care must be exercised in removing all doubtful tissues. If need be, the cautery could be used for their complete destruction, or substituted entirely for the suture of these parts. The exposed flap is next attacked with knife or large pointed scissors curved on the flat, and the original tract, its branches, and the entire fistulous zone including every branching tract resected. Careful search will be made in the ischiorectal fossa and perirectal spaces for any concealed tracts. The whole field is then carefully flushed with normal salt solution, and if need be, antiseptized and the fat layers sutured with buried catgut so as to close all dead spaces. In many cases the entire wound may be closed as in the case of breast amputations, or a small drain may be left for twenty-four or forty-eight hours.

THERAPEUTICS

UNDER THE CHARGE OF

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Aspirin as a Remedy for Cough.—EBSTEIN (*Deutsch. med. Woch.*, 1911, xxxvii, 1476) has had good effects in the treatment of cough with aspirin. He has seen it give relief when codeine had failed. He believes that it does more than give relief, that it tends to cure and materially shorten the duration of the cough.

The Action of Vasotonin.—SCHALTENSTEIN (*Deutsch. med. Woch.*, 1911, xxxvii, 695) has used vasotonin in increased blood pressure due to aortic insufficiency, arteriosclerosis, and aneurysm. About fifteen injections were given as an average treatment, usually every day or every other day. The lowering of the blood pressure was not very noticeable, and the effects were not permanent. However, in a number of patients cardiac attacks were much diminished and in some this result occurred after other remedies had failed. The remedy had no effect at all upon high blood pressure due to a chronic nephritis. No untoward effects were noted from its use.

Iodival.—BAYER (*Therapie d. Gegenwart*, 1911, lii, 335) says that in his experience iodival, in spite of its high iodine content, has not given rise to symptoms of iodisin after the continued use of it in doses of 0.3 gram three times a day. It seems to have a special affinity for nerve tissue, and animal experiments have shown that both fat and nerve tissue are rich in iodine after the administration of iodival. Bayer has noticed clinically very good results in brain affections treated with iodival, and he believes that they may be explained by a selective action of iodival upon nerve tissue. Iodival has no unpleasant taste and does not give rise to gastro-intestinal irritation.

The Use of Foods Rich in Inulin in Diabetes.—STRAUSS (*Therap. d. Gegenwart*, 1911, lii, 347) advocates various vegetables rich in inulin for the dietary of diabetes. He believes that they are especially valuable for the treatment of severe cases with acidosis. Besides their content of carbohydrate, that seems to be better tolerated than ordinary carbohydrates, they offer a source of vegetable proteid. Among these he mentions artichokes, Jerusalem artichokes, dandelion roots, dahlia tubers, and various members of the Lelianthus family. These may be given as vegetables, or in soups, and he suggests various methods of preparation to render them palatable. Inulin has also been given in pure form, but it is too expensive for ordinary use. From some of these vegetables a flour has been prepared, as in the case of that derived from Jerusalem artichokes.

The Use of Salicylates in Rheumatism.—Alex. Lambert (*Jour. Amer. Med. Asso.*, 1911, lvii, 898) says that, in using salicylates in rheumatism, if within forty-eight hours a distinctly beneficial action is not obtained with the form of salicylate that is being used for that patient, some other form of salicylate should be employed. Most patients are easily irritated by salicylic acid and their stomachs soon reject it, yet these same patients will readily take sodium salicylate with no disturbance. Sodium salicylate, if given in solution with an excess of alkali, is infinitely less irritant to the gastric membrane than when given in powder form. Some patients cannot take sodium salicylate, and yet they tolerate oil of wintergreen in large doses and rapidly respond to it. This natural oil of gaultheria is no longer on the market, but the oleum betulæ, or oil of sweet birch, contains the same natural methyl salicylate. The natural salicylates seem to be less irritant and are more active than the synthetic salicylates. Synthetic methyl salicylate is not suitable for internal use, and should only be used externally. Lambert mentions salol, salicin, and salophen as forms of salicylates that may benefit when the more usual remedies fail. He particularly recommends salicin for rheumatic affections in children and in the aged as the form which is the least depressing and from which the most benefit seems to be obtained. Results from the use of aspirin in rheumatism have been disappointing to Lambert personally, although it is highly recommended by some. He mentions the hypodermic method of giving salicylates as recommended by Siebert. The results of treatment by this method are excellent, and this method may prove of advantage in those patients who cannot take salicylate by mouth. Lambert recommends highly a form of salicylate the use of which seems to reduce to a minimum the irritating and toxic symptoms. This salicylate is prepared as follows: Oleum betulæ is saponified either by superheated steam or caustic alkali; the resulting methyl alcohol is driven off by heat and the resulting salicylate is decomposed by sulphuric acid and washed until free from sulphates. After the salicylic acid is purified by recrystallization it is mixed with an excess of sodium bicarbonate and made into tablets with a sugar binder. These tablets are freely soluble in water with a pleasant acid taste and with a free elimination of carbon dioxide. Lambert says that this form of salicylate enables one to get a large amount of active salicylate into the circulation at once in the least toxic and most effective form of the natural salicylate. It is unforunately doubtful whether they will be in general use because of their expense. It is an exceedingly active and useful form of salicylate, however, with a maximum of rapidity of absorption, effectiveness after absorption, and a minimum of toxic action.

The Use of Arsenic in the Treatment of Chlorosis.—Seiler (*Deut. med. Woch.*, 1911, xxxvii, 1340) relates the results obtained by him in the treatment of 33 patients suffering from chlorosis. Thirteen of these patients were treated with arsenic alone, 12 received iron only, and the remaining 8 were given a combined treatment with both iron and arsenic. Seiler gave the arsenic in the form of arsenous acid in doses of from 0.005 gram to 0.01 gram a day either in pill form or by subcutaneous injection. The patients treated with arsenic alone derived

little or no benefit. The hemoglobin percentage after two or three weeks of this treatment increased slightly, but there was an actual fall in the number of red blood cells. In addition to this lack of improvement, untoward symptoms frequently occurred from the use of the arsenic. Consequently, Seiler believes that arsenic alone has no therapeutic effect upon chlorosis. Iron alone was given in the form of a modified Blaud's pill for four weeks. The hemoglobin percentage increased markedly and the number of red blood cells rose to nearly normal. The average of 49 per cent. hemoglobin rose to 87 per cent. and the number of red blood cells increased from 4,000,000 to 5,000,000. The patients treated with iron and arsenic in combination received in addition to the Blaud's pill an average dose of 0.006 gram of arsenous acid a day. After four weeks of this combined treatment the average hemoglobin percentage rose from 37 to 96 per cent., and the red blood cells increased from 3,000,000 to 5,100,000. Seiler believes that this combination of iron and arsenic has a more rapid and more complete curative action than iron alone.

The Practical Significance of the Wassermann Reaction in the Treatment of Syphilis.—PLEHN (*Berlin. klin. Woch.*, 1911, xlviii, 1544) believes that the Wassermann reaction is by no means a reliable guide for the treatment of syphilis, especially in its late manifestations. He had the serum of 200 patients tested for the Wassermann reaction with the examiner ignorant of the clinical history of the patient. The results were not in accordance with the clinical history in many instances. Nine patients who gave a positive Wassermann reaction repeatedly had reached an advanced age without ever having had any manifestations of their syphilis after the first infection. He also says that the Wassermann reaction may become negative even when marked manifestations are persistent or syphilitic symptoms may develop a considerable time after a negative complement deviation test. A negative reaction, therefore, does not always indicate a cure, and Plehn believes that parasyphilitic symptoms especially may develop a long time after a negative reaction. The reaction may be positive for years while the patient is entirely free from clinical symptoms, and, according to Plehn, this positive reaction cannot be considered as proof of the syphilitic nature of clinical symptoms developing during this time. The symptoms may or may not be due to the syphilitic virus. The author says that the Wassermann reaction is only one symptom of syphilis and that the diagnosis of active syphilis must not rest upon that alone, although he believes that it often helps in doubtful cases. He cites the case of a young man who, because of the knowledge of a positive Wassermann reaction, although he had no clinical symptoms of syphilis, was so much depressed that he committed suicide. At the autopsy not the slightest evidence of syphilis was found. Plehn summarizes his views by the statement that complement fixation should be used with great care in diagnosticating symptoms occurring during late periods of syphilis because it often proves to be an erroneous guide. This fact is especially true in the differential diagnosis in diseases of the central nervous system. He also believes that complement fixation alone can never be an indication for or against specific treatment except when it determines the diagnosis of syphilis in the early stage.

The Crotalin Treatment of Epilepsy.—SPANGLER (*New York Med. Jour.*, 1911, xciv, 517) gives a tabulated report of 36 cases of epilepsy treated with hypodermic injections of rattlesnake venom. The present article confirms the results as related in a preliminary report on the same subject. Spangler says that the venom treatment is indicated in the so-called idiopathic form of epilepsy. Under the crotalin treatment the character of the convulsions is modified, the interval between the attacks lengthened, and the mental and physical condition of the patient is improved. It is important to use a solution of the venom of definite and uniform strength. It is most essential to determine the strength of dose necessary to cause a satisfactory local reaction, that will produce a systemic effect sufficient to control the convulsions. Experience and observations as to the character of the local reaction are of great value in determining the proper dose for each individual case. Spangler gives the details of the technique for the injection and indicates his method of ascertaining the proper dose for the individual case. He says that organic epilepsies, including those forms arising from traumatic lesions of the skull or brain, such as tumors, cannot be expected to yield to the venom treatment. Likewise, no influence on alcoholic epilepsy or convulsions arising from uremic or eclamptic conditions can be looked for. Although only three of the cases reported resulted in cures, yet the general improvement in the patients' mental and physical condition was so marked that Spangler warmly advocates this method of treatment in all cases of idiopathic epilepsy.

Experiments on the Relation of the Thyroid to Diet.—HUNT (*Jour. Amer. Med. Assoc.*, 1911, lvii, 1032), acting upon the hypothesis that certain diets have specific effects on the activity of the thyroid gland, has endeavored to support this by animal experiments. The method employed is based on the increased resistance which mice show to acetonitril after the feeding of thyroid. Earlier experiments had shown that the resistance to this poison was much greater in the case of mice that had a diet of oatmeal, or of oatmeal and liver, than in the case of those that had a diet of eggs, crackers, and milk. The results were in entire harmony with the above hypothesis, although Hunt does not consider the experiments sufficiently numerous or varied to be entirely conclusive. In his summary he says that these experiments afford additional experimental support for the view that certain diets have specific effects on the thyroid glands of some of the lower animals. It is probable that analogous relations hold for human beings. Although it is possible that the effects differ in different classes of animals, it would be interesting to determine if, in cases of hypothyroidism, the administration of oatmeal and liver, for example, would have a favorable influence, and if the withholding of them from patients with hyperthyroidism would be found advantageous. The most promising class of cases for such observations would be the mild degrees of thyroid derangement, such as those recently described by Kocher in his Nobel lecture.

PEDIATRICS

UNDER THE CHARGE OF

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Epidemic Summer Diarrhea and Vomiting.—HAROLD WALLER and GERALD WALKER (*Brit. Med. Jour.*, 1911, No. 2646, p. 594) report an epidemic of summer diarrhea as seen in the East London Hospital for Children. About one-third of the children seen in the out-patient department suffered from this condition. From July 1 to August 18 there were 125 admissions for this condition. Of these, 50 died and 75 were discharged cured. The large proportion of cases were bottle-fed and marasmic. Severe attacks in breast-fed babies were wholly exceptional. Condensed milk seems to have been the staple article of diet among these children, although the barley water so often an ingredient is believed to be sufficiently dangerous in itself to be responsible for a great deal of the trouble. This is due to the strange recipes for making the barley water, and to its being allowed to stand on a hot day in dirty jugs. The majority of cases occurred in infants from four to twelve months old and considerably under the normal weight. Rickets were common in the older children. In nearly all the cases there was pyrexia. The general condition exhibited sunken eyes, depressed fontanelles, skin dry and wrinkled, great loss of subcutaneous fat, and sunken abdomen. Abdominal distention was uncommon. The tongue and palate were very dry and often covered by thrush. While the high mortality suggests poor treatment before admission, the attack in many cases followed gross misfeeding. The general treatment is as follows: On admission the stomach is washed with a 0.9 per cent. saline solution, after which the vomiting usually ceases absolutely. The bowel is irrigated with the same solution until clear. If collapse or shock is present, a mustard bath or mustard pack is given. A subcutaneous infusion of normal saline or a 5 per cent. solution of glucose in normal saline is then given for several hours. This last treatment is of the greatest importance, but must be given at about 105° F. to be readily absorbed. An inverted vacuum flask is fitted with a rubber stopper containing two holes, one for a glass tube admitting air, the other tube, of the "two-way" kind, carries the fluid through two pieces of rubber tubing 8 inches long, to which are attached small silver infusion needles. The child is placed on its back and the limbs secured with bandages to the side of the cot. The abdomen and thighs are prepared for surgical procedure. A board with a hole in the centre supporting the inverted flask is laid across the side of the cot. The apparatus is sterilized and the flask filled with the requisite amount of saline at 120° F. The needles after insertion are covered with sterile gauze. About 7 to 10 ounces of saline are employed and will take two hours to run in, an occasional inspection of the apparatus being sufficient. Frequent repetition of the subcutaneous infusion is necessary

to replace the loss of fluid in the tissues. Water, preferably hot, is all that is given for twenty-four hours. Whey has been extensively tried as the first food and answers well, but tends to cause a dirty condition of the mouth. A 5 per cent. solution of glucose, to which albulactive may be added, is useful. Milk, freely diluted with water, and with only the addition of sodium citrate, is tried only when the diarrhea subsides. Open air treatment during convalescence is invaluable. Of drugs, calomel in repeated small doses, castor oil, ℥ij to ℥v, and opium are the most valuable. Bismuth is most deadly in anything but quite the last stages. In no instance has the complaint been contracted by children suffering from other conditions, although in the same ward. Bronchopneumonia was the cause of death in 8 cases. Excellent nursing is absolutely essential for good results.

Typhoid Fever in Childhood: An Analysis of One Hundred Consecutive Cases.—Eric Bellingham Smith (*Brit. Jour. Child. Dis.*, 1911, viii, 390) reviews 100 consecutive cases of typhoid fever in children, aged from one to twelve years. The main features of the disease at this age are especially discussed. In the great majority the attack was an isolated one in the family, and its origin was untraceable. Sex apparently has no influence, as 51 of the cases were girls and 49 were boys. Age, however, is an important factor. No case in this series was under one year, but from this period to twelve years there was a steady increase in the number of children infected. The duration of the disease was variable. In 88 cases the time of onset was fairly well established. Of these 88 cases, 6 lasted only eight to twelve days, 43 from fifteen to twenty-one days, and 39 for twenty-one days and over. The shortest illness was eight days, and the longest fifty days. The disease is less serious in children than in adults. Vomiting at the onset is fairly common, and occurred in 27 per cent. of the cases. More often this onset is gradual and the symptoms differ little from the adult type. Severe onsets at times simulate meningitis. Of the 100 cases, 8 per cent. exhibited this meningitic type and 16 per cent. showed marked mental irritability. Diarrhea frequently ushers in the disease, but rarely continues severe. A fourth type exhibits prominent pulmonary signs, as diffuse bronchitis, with poorly marked physical signs, but a high pyrexia. Headache, bronchitis, and slight diarrhea, with gradual emaciation, occasionally form the only symptoms. Occasionally the disease exhibits itself under the guise of other ailments. In 2 cases a marked tonsillitis was the most prominent symptom. In 2 others marked emaciation was the only feature. Again, cases occur with scarcely any evidence of ill health. The symptoms during the course of the disease presented very little difference from those in adults. In this series the rose spots were present in 64 per cent. of the cases and splenic enlargement in 51 per cent. The stupor and coma of adults rarely occurs in children. Delirium, usually nocturnal, is present. Subsultus is uncommon. Pulmonary symptoms are often absent. Emaciation is a constant feature. In this series 17 per cent. showed myocardial trouble during the third week, and a slight affection of this nature is probably the most common complication of typhoid fever in children. Nephritis is rare, while otorrhea and deafness are not uncommon toward the end of the illness. Abscesses and

boils are not uncommon at the end of the illness. Hemorrhage and perforation are infrequent. In this series 50 per cent. recovered at the end of the second or the beginning of the third week, showing that slight swelling or superficial ulceration of Peyer's patches is probably all that occurs in these cases. In the two fatal cases of perforation the children were aged eleven and twelve years respectively. Hemorrhage from the bowel occurred in 7 cases, in 4 of which it was slight; in 3 it was severe, but not fatal, and showed the usual collapse symptoms. In these 3 cases the hemorrhage occurred during the fourth week. The stools in 22 per cent. of the cases were typical, in 18 per cent. constipated, in 17 per cent. green and offensive, and in 34 per cent. there was some degree of diarrhea. Convalescence is rapid, constipation being usually the only difficulty; 11 per cent. of cases had a typical relapse. The pyrexia of typhoid in children is as atypical as the stools, and may be continuous, intermittent, and irregular, or remittent. The prognosis is good. In this series there were 7 deaths from the following causes: Perforation, 2; toxemia, heart failure, 2; pneumonia, 1; suppurative parotitis, 1; pneumonia, empyema, cancrum oris, 1. In 76 cases of this series, 58 gave a positive Widal reaction. Drugs have no influence on the course of the disease. The diet should be milk, plain, citrated, or peptonized. Constipation is relieved by beef tea and chicken broth in the dietary and enemata. Strychnine and brandy control myocarditis. The toilet of the mouth is most important, and antiseptic remedies should be constantly applied. High temperature and delirium are treated by sponging with tepid or cold water. Cold baths and ice are not recommended.

Deafness from Mumps.—Oscar Mauthner (*Wien. med. Woch.*, 1911, lxi, 2090) calls attention to the severity of deafness occurring as a complication in mumps. In 1898 Gallavardin collected over 51 cases of complete, permanent deafness occurring in acute epidemic parotitis. In the majority of cases this condition arises suddenly during the course of the disease, and is ushered in by a roaring or rushing sound in the affected ear, developing rapidly into complete and permanent deafness. There is rarely local pain and almost never an affection of the middle ear. The onset is further characterized by severe dizziness, loss of equilibrium, nausea, vomiting, and headache. These symptoms, denoting involvement of the vestibular apparatus, usually accompany the deafness or occur several days later, but in some cases they appear even before the swelling of the parotid gland. Mauthner reports the case of a woman with bilateral epidemic parotitis. On the first day there was a ringing in the left ear, which increased to a roaring noise, and forty-eight hours later there was absolute deafness in the affected ear. Dizziness and nausea appeared forty-eight hours later. The dizziness and unsteady gait persisted for six weeks. The roaring noise and deafness have continued for eight months. A treatment of pilocarpine internally and the faradic current locally had no effect on the condition. After a lengthy discussion of the various factors and clinical manifestations of the reported cases, Mauthner concludes that the process in this type of deafness is similar to that of an acute infectious neuritis—a neuritis of the auditory nerve.

OBSTETRICS

UNDER THE CHARGE OF

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The Treatment of Excessive Vomiting of Pregnancy.— MARTIN (*British Medical Journal*, July 8, 1911) describes the method of treatment employed at the Glasgow Maternity in cases of excessive vomiting of pregnancy. On admission a thorough examination was made, and in most cases some cause was found which affected the patient's general health; bad teeth and chronic constipation were associated in every case. The patient was strictly confined to her bed, was encouraged, and told that she would recover; the stomach was thoroughly irrigated with the tube and warm water at 100° F. Large quantities of mucus were obtained. Sips of water were allowed that night and an enema of soap and water given in the morning. A test meal was given next morning and withdrawn one hour after by the stomach tube. In no case was the test meal returned, and in one patient no vestige of the test meal was obtained by again irrigating the stomach. In all but three cases the free hydrochloric acid and total acidity were normal. In three the quantity was slightly diminished. The motor activity of the stomach was tested and found normal and microscopic examinations of the stomach washings were negative. Patients were fed on peptonized milk and milk and soda water and as soon as possible a light diet. A powder containing 1 grain of mercury with chalk and 3 grains of sodium bicarbonate was given three times daily. Magaesium sulphate in hot water was given every second morning if needed. Enemata were used as necessary. The septic condition of the mouth was treated by carbolic acid solution, 1 to 80. The patients were urged to drink large quantities of milk and soda, weak tea, or other alkaline drinks. In 16 cases the method was successful, the average stay in the hospital being seventeen days. In one case there was retroversion of the uterus, but this was not interfered with, and the patient made a good recovery. In 5 cases there was a well-marked acetone odor. Fifteen of the patients were admitted during the winter months when the climate was cold and damp.

Tincture of Iodine as a Disinfectant in Obsteric Practice.—SCHMIDT (*Zentralbl. f. Gyn.*, 1911, No. 25) in 52 cases employed tincture of iodine as an antiseptic. These cases included artificial dilatation of the cervix by various methods, breech extraction, version and extraction, including twin pregnancy and placenta prævia, the application of forceps, embryotomy of various sorts, and manual removal of the placenta and fetal appendages. The ages of the patients varied from eighteen to forty-three years. In 15 the puerperal period was without the slightest elevation of temperature; in 16 the temperature was abnormally low; in 3 it reached 99.5° F.; in one, after artificial removal of the placenta, when the patient had been examined by a midwife outside, the temperature reached 101° F., and in one case dying of eclampsia and ane-

mia, the patient's temperature reached 102° F. In 15 cases stitches were taken in a torn perineum and in episiotomy wounds. These cases also healed by first intention and remained without fever. No eczema or other irritation of the skin was observed.

Intra-uterine Cry.—KONOPHA (*Zentralbl. f. Gyn.*, 1911, No. 25) describes the case of a multipara four weeks before her actual time of confinement, who suffered from edema in the lower extremities, albuminuria, and scanty secretion of urine. The pregnancy was interrupted because of the abdominal distention, the patient suffering with albuminuria. When the membranes ruptured considerable amniotic liquid escaped; the case was found to be twins, the first child presenting by the breech. To hasten delivery, the physician drew down upon one leg of the child, when it was heard distinctly to cry in the uterus. The child was immediately extracted and the umbilical cord found coiled three times about the neck, and readily loosened. The child was asphyxiated, but very soon revived. On introducing the hand into the uterus to extract the second child, air escaped. The mother and children made a good recovery without complications.

Forty Cases of Placenta Prævia.—EDGAR (*Amer. Jour. of Obstet.*, July, 1911) gives his results in the treatment of 40 cases of placenta prævia—10 central, 9 partial, 21 marginal. Seventeen of these were ambulance or emergency cases, first seen at the beginning of bleeding. In 23 bleeding had lasted from a few hours to several days. Seventeen of these patients had received various treatments before entering the hospital, and 23 were treated exclusively by the hospital. In 29 cases the cervical dilatation was two fingers or less when the patient was first seen. The treatment employed was cervical and vaginal gauze packing in 32 cases; De Ribe's bag in 3 cases; Pomeroy's bag in 7; bimanual dilatation as a preliminary measure in 2, gauze packing in 10. Labor was induced in 9 cases. The methods of delivery were version and breech extraction in 20 cases, the use of forceps in 6, breech extraction without version in 5, spontaneous delivery in 8, making, with the one case not delivered, 40. The uterus was tamponed after delivery in all cases. The maternal mortality was 7.5 per cent., the fetal mortality 32.25 per cent. The conclusion was reached that cervical and vaginal packing with gauze is efficient in controlling hemorrhage, in securing dilatation. These mortality rates are thought satisfactory in cases one-half of which were ambulance or emergency cases. Version and breech extraction cause a higher infant mortality than delivery by forceps, simple breech extraction, and spontaneous expulsion.

Inflammatory Disease of the Adnexa and Pelvic Tissues in Parturient Patients and its Treatment.—THALER, from Schauta's Clinic (*Archiv f. Gyn.*, 1911, Band xciii, Heft 3), gives the results obtained from 6000 cases of inflammatory disease of the adnexa treated by operative means. He found in the majority of cases some efforts at spontaneous cure had been made, and that often the secretion of large quantities of pus was not necessarily fatal. Although conservative measures should be used in all cases, it was found that in at least 10 per cent. these measures failed and operation only was indicated. He inclines strongly to the belief that extirpation of diseased organs is, in the long run, the only

reliable treatment. He does not believe that incision is followed by permanent improvement. He prefers to operate by the vaginal method wherever it is possible. Where, however, there are many and firm adhesions, and there is reason to believe that the appendix is involved, he would select the abdominal route, employing drainage through the vagina, in complicated cases. The abdominal method is also preferable where the position of the uterus has been greatly altered and it is desired to correct it. Transverse incision is preferable in severe cases where the operator fears infection from the rupture of a pus sac or injury to the intestine, although due allowance must be made for the prolonged healing and the risk of suppuration in the transverse wound. The appendix should at least be inspected in all cases, and if adherent or altered, should be removed. The total extirpation of the uterus followed by drainage through the vagina will give the best result in septic cases, even accompanied by injury to the bowel. His observation shows that in the majority of cases radical operation is safer, and followed by better and more permanent improvement, than if the conservative method has been followed. This remains true in many cases where it would seem reasonable to expect that conservatism in operating would give excellent results. Where conservatism is to be employed, salpingectomy, bilateral, with the leaving of one or both ovaries, ventrofixation of the uterus, and excision of the insertion of the tubes into the uterus, gives good results. When, however, the indications for drainage are clear and definite, conservative treatment should not be employed. The same decision is made in cases where the patient suffers from severe and practically uncontrollable hemorrhage. The mortality of cases treated by vaginal extirpation where suppuration was absent was 1.8 per cent., and where suppuration was present, 2.8 per cent. The general mortality of abdominal operations on the adnexa was 5.3 per cent. without suppuration, and 8.6 per cent. with suppuration. During the last three years 50 cases of tubal suppuration had been treated by the abdominal method, with a mortality of 6 per cent. A permanent result with good union followed radical operation in 93.5 per cent., while under favorable circumstances only, abdominal conservative operations were followed by permanent recovery in 72.2 per cent. When the very practical question is raised as to what treatment gives the patient the best permanent result, with ability to work and to support herself and with freedom from pain, it is found that radical operation is more successful than efforts at conservatism. When inflammation of the adnexa is complicated by pregnancy, intra-uterine or extra-uterine, or by appendicitis, or the process present is found to be tuberculous infection, the best results followed conservative treatment. It is also interesting to note that permanent infection of the adnexa rarely follows puerperal infection, and that these cases tend to spontaneous recovery.

The Best and Worst Methods of Treating Placenta Prævia.—Fry (*Amer. Jour. of Obs.*, July, 1911) considers version without extraction the best method of treating placenta prævia, and those methods which result in rapid extraction the worst and most dangerous. He lays stress upon the careful and efficient packing of the uterus with gauze, after the removal of the child, as a most valuable method of preventing postpartum hemorrhage.

GYNECOLOGY

UNDER THE CHARGE OF

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Relation of the Sigmoid to Pelvic Disease.—BARRETT (*Surg. Gyn. and Obst.*, 1911, xiii, 320) calls attention to the fact that gynecological surgery had been under development for many years before the close and important anatomical and pathological relationship which exists between the pelvic organs and the appendix came to be realized, and says that while this is at present well recognized, the even more intimately related pathology of the sigmoid is only just beginning to be appreciated by gynecologists. The position of the sigmoid may vary greatly according to whether it has a short or long mesosigmoid; in the latter case it may prolapse into the pelvis, and has been found adherent to practically every known pelvic and abdominal structure. It becomes, therefore, a looped, kinked, or sacculated structure, with congenital or acquired diverticula, loaded with irritating excreta, swarming with bacteria within, and subject to bacterial invasion from without. The author considers that while the sigmoid is certainly prolific in producing pelvic disease, it is even more often involved secondarily to genital trouble. When involved in a pelvic abscess by forming part of its wall the inflammation may extend throughout the coats of the sigmoid, causing thickening and perforation, followed by a secondary infection of the abscess with colon bacilli. Much left-sided pelvic pain is undoubtedly due to adhesions, kinking, constrictions, etc., of the sigmoid, and many of these patients will be found on careful questioning to have had attacks of alternating constipation and diarrhea, or to have passed mucus or blood. In doing any intra-abdominal operation on the round ligaments it is especially important to free these organs from all adhesions, so as to prevent any traction or knuckling of the bowel. In removing thickened appendices epiploicæ it should be remembered that they may contain a lumen communicating with that of the gut, so that in removing them we may be opening the bowel, and should treat the stump accordingly. In conclusion, the author emphasizes the fact that in the performance of any laparotomy for pelvic disease conditions of the bowel ranging from adhesions to malignant newgrowths, may be met with, and that every pelvic operator should, therefore, be thoroughly equipped to do intestinal surgery.

Carcinoma of the Uterine Body.—In an article of some ninety pages in length, HEURLIN (*Arch. f. Gyn.*, 1911, xciv, 402) discusses the anatomical characteristics and method of growth of corpus carcinoma, his conclusions being based on the exhaustive investigation of some 50 cases of that and allied conditions, together with a most extensive

review of the literature. He believes that this form of carcinoma always originates in one circumscribed location in the mucous membrane, and is, therefore, strictly unicentric in origin; where several distinct foci are found, even though they be of approximately equal size, he considers the condition due to lymphatic metastases rather than to a multicentric origin of the growth. The intact mucous membrane of the corpus can always be seen, at least microscopically, to have a definite limitation against the carcinoma; the former is invaded and displaced by the latter. While most cancers of the corpus are adenocarcinomata, Heurlin thinks the term "malignant adenoma" should be retained for that form in which the glandular epithelium retains its single-layered character, although this type of tumor may be as malignant as any other. The old theory that an adenocarcinoma arises from an "endometritis glandularis" must be given up, as the author found the mucosa atrophic in all his cases, with intact, normal, or cystic glands. He does not believe that primary epithelial changes exist from which a very early diagnosis of beginning carcinoma can be made, as neither morphological changes in the cells, atypical mitoses, nor atypical proliferation are of value in this respect, nor is the presence or absence of a demonstrable breaking through of the membrana propria of the glands on the part of the epithelium an available criterion. He has never found carcinoma of the corpus to extend along the mucosa into the cervix; it always stops where the character of the surface epithelium changes, at the internal os, but it may extend into the cervix deep in the muscular wall, and then reappear on the surface.

Topography of the Ureter.—In order to determine the normal course of the ureter during life, SCHMIDT and KRETSCHNER (*Surg. Gyn. and Obst.*, 1911, xiii, 287) carried out a series of investigations on perfectly normal individuals, using for this purpose ordinary ureteral catheters armed with fuse wire, which because of its great pliability gives rise to less irregularities or distortions than any other substance, *x*-ray pictures being taken with the patient always in the prone position. It was found that the ureters had a very varied course in these supposedly normal subjects, some being almost straight, others S-shaped, others markedly serpentine and irregular. In some cases the two ureters ran almost parallel throughout their whole course, in others they drew quite close together in the lower portion, spreading farther apart above, etc. The authors believe as a result of these investigations that it is impossible to say whether a given shadow on an *x*-ray plate is in the course of a ureter or not unless the picture is taken with a shadowgraph catheter in place, and that the frequent atypical course of the ureter explains the ease with which this organ is injured during operations on neighboring structures.

Origin of Hydatid Mole.—FALGOWSKI (*Monatsschr. f. Geb. u. Gyn.*, 1911, xxxiv, 290) reports a most interesting case of twin pregnancy (2 ova), in which a normal child and placenta, and an hydatid mole were delivered at term, evidently one ovum having developed normally, while the other had undergone hydatid change. There was no trace of an embryo in the latter. The author considers that this case furnishes strong evidence in favor of the view that the development of an

hydatid mole is due to some primary disease of the ovum, it not being conceivable that endometritis or any other uterine condition was the cause here, since only one ovum was affected. Moreover, the only way to explain it by a multicystic degeneration of one ovary (Marchand's theory) would be to assume a superfetation of two ova, one from each ovary, at different times, a most improbable occurrence. Neither can the development of an hydatid mole be considered due to the death of the embryo, as in the large majority of cases where, from some cause or other, death of the embryo occurs this is not followed by the formation of an hydatid mole; on the other hand, cases are known where only a small portion of the chorion has undergone this change, the remainder being normal, in which death of the fetus did not take place.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES

UNDER THE CHARGE OF

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Paresthesia of the Pharynx an Advance Symptom of Tumors of the Digestive Tract.—PUGNAT (*Revue Hebd. de Lar., d'Otol. et de Rhinologie*, January 7, 1911) reports and comments upon three elderly patients who consulted him for uncomfortable sensations in the pharynx which could not be relieved by treatment. The first case was followed in six months by an inoperable cancer of the intestine; the second was followed in six or seven months by fatal cancer of the stomach, and the third, was followed in four months by a cancer of the rectum, which was removed. He therefore suggests that in all cases of paresthesia of the pharynx, which cannot be otherwise accounted for, careful exploration should be made of the gastro-intestinal tract.

Sarcoma of the Tonsil in an Infant.—CLINE (*The Laryngoscope*, March, 1911) reports a case of sarcoma of the tonsil in a male child, aged twenty-two months. Two months prior to the visit it had had what was thought to be tonsillitis, which developed two weeks later into a tonsillar abscess. The abscess had ruptured and a considerable amount of purulent fluid discharged. On examination, a nodular growth was found involving the left tonsil, almost filling the pharynx. It was rather soft to the touch and bled profusely upon pressure. Microscopic inspection of a section removed revealed it to be a sarcoma. Urgent dyspnea was relieved by removing as much as possible of the growth with the cold snare and the tonsil punch, which was done without much hemorrhage. Radical operation was out of the question. The child grew rapidly worse and died in two weeks.

Sporotrichosis of the Tongue and Pharynx.—Duverger and Bain (*Revue Hebd. de Lar., d'Otol. et de Rhinologie*, April 15, 1911) report a rare case of lingual and pharyngeal sporotrichosis with menacing asphyxia from which cultures were made of the sporothrix Beurmanni. The patient was a Syrian lad some fifteen years of age, sent with a diagnosis of double periamygdalien phlegmonitis. The tongue was very much swollen and projected beyond the teeth, and was covered with a thick papiermache-like deposit more than ½ cm. in depth. It had great physical resemblance to that of burns of the tongue from acid, especially of phenic acid. There was edematous enlargement of the buccal floor and the sublingual glands. The mucous membrane of the palate was infiltrated, somewhat pale, milky in spots, and covered with small stellate whitish patches, particularly numerous on the soft palate, the arches, the hard palate, and the pharynx. The tonsils, on the contrary, were but slightly voluminous and presented a very discrete yellowish-white deposit, as also did the internal face of the cheeks. The examination of the larynx was not practicable. There was great difficulty in respiration, in mastication, and in deglutition. As to treatment, the tongue was curetted of a mass of pale yellowish papiermache-like material of a very repulsive and putrid odor. The ulcerated surfaces were touched with strong iodo-iodurated solution, and boroöxygenated mouth washes were prescribed, and four grams of iodide of potassium administered daily, under which the patient made a rapid recovery. The sporothrix of Beurmann was recognized under the microscope and cultures made, the results of which are described and depicted in the article which, in addition, gives a summary of what is known of this rare malady.

Menthol in the Nasal Passages Dangerous to Infants.—Mayet (*Revue Hebd. de Lar., d'Otol. et de Rhinol.*, April 22, 1911) has observed two cases of asphyxia from the introduction of mentholated preparations into the nasal passages of infants, and he refers to several similar accidents reported by other writers. He concludes that menthol should be proscribed from infantile therapeutics.

Nasal Neuralgia.—Brœckaert (*Annales des Mal. de l'Oreille, du Lar., du Nez et du Pharynx*, Livraison 1, 1911) describes and depicts his method of exposing the branches of the nasal nerves and tearing them from their beds in the successful treatment of this painful affection.

Nasal Diseases following Injuries of the Head.—Ziem (*Jour. of Lar., Rhinol., and Otology*, March, 1911) expresses his astonishment that so little stress is laid upon the state of the nose and sinuses after injuries to the head. He reports in detail 3 cases in point and refers to several others. In all 3 cases there was a lesion of the right side, but in 1 only was the speech affected, although the patient was right handed. Involvement of the middle ear was present but in 1 case. Injuries to vision occurred in all of them, and various other nervous manifestations, bad dreams among them. Hemorrhage from the mouth and nose and hemilateral anosmia existing in all 3 cases was referred to fracture of the ethmoid. Ultimate nasal obstruc-

tion, due to tumefaction of the mucous membrane, seemed to have been treated with success topically with nasal, intranasal, and ethmoidal douches of salt water.

Bone Cyst of the Ethmoid Cells.—Thompson (*The Laryngoscope*, March, 1911) reports a case of a lady who had been annoyed for several months by a very profuse serous discharge from the right nostril when she stooped. This discharge was found to escape from a small opening in the top of carious bone in the wall of the bulla ethmoidalis. The dividing walls of the ethmoid cells had all been destroyed, making one cavity of the lateral mass of the ethmoid bone. This cavity was lined by a thin, white, glistening membrane, the typical cyst lining in appearance. This membrane was curetted lightly, the cavity was packed for twenty-four hours to control hemorrhage, and then removed. A month later it was reported that the only change was that the discharge was now continuous, whereas formerly it had taken place only upon stooping. Inspection of the nose showed a free opening into the cyst with fully two-thirds of the cavity covered with normal membrane. Six weeks later the patient reported entirely well.

Ulceromembranous Laryngitis.—Moure (*Revue Hebd. de Lar., d'Otol. et de Rhinol.*, March 11, 1911) reports and discusses 3 cases, 1 of Reiche, 1 of Arbow Smith, and 1 of his own, in which he identified the affection with the pathological features of Vincent's angina.

Calcined Magnesia in the Treatment of Diffuse Papillomas in the Infant Larynx.—Claoué (*Annales des Mal. de L'Oreille, du Lar., du Nez et du Pharynx*, Livraison 1, 1911) reports two cases of his own and refers to a third in the practice of a friend in which diffuse recurrent papillomas of the larynx, after operation, underwent retrogression under treatment of one-half gram of calcined magnesia daily for a few weeks. He mentions that in veterinary medicine papillomas are very frequent, especially in the mouths of dogs, and the heroic, while empiric remedy is calcined magnesia. (Small doses, three grains each, of sulphate of magnesia have been known to produce similar results.)

Acute Thyroidism following Removal of Thyrolingual Cyst.—Davis (*Journal of Laryngology, Rhinology, and Otology*, January, 1911) reports this case. A girl, aged seven years, had a small swelling under the jaw in the middle line which the parents wished removed, as it was a disfigurement. A cyst as large as a grape was found attached to the tongue and hyoid bone, from which it was easily removed entire, the wound sutured with horsehair and closed with collodion. The child became restless in the evening, the temperature rising to 104°, with intermittent and irregular pulse (160 per minute), dilated pupils, and intense facial congestion—signs of acute thyroidism. The neck became swollen and puffy, and continued so for six weeks. The wound healed by first intention. The child complained of no inconvenience beyond "her heart thumping." The disturbance was attributed to leakage of thyroid secretion and its absorption in a wound which was undrained.

Pharyngoscope.—ANDRÉ (*Annales des Mal. de l'Oreille, du Lar., du Nez, et du Pharynx*, March, 1911) describes a new pharyngoscope very much on the model of Hays', but provided with an articulating mirror which can be deflected in different directions by a guide in the handle.

Embryonic Cysts of the Gums and Retropharyngeal Region.—ONODI exhibited to the Royal Hungarian Society of Physicians (*Jour. of Lar., Rhinol., and Otol.*, August, 1911) an eight months' fetus with cysts in the gums and retropharynx filled with embryonic jelly. The retropharyngeal cyst was 10 mm. long, 13 mm. high, and 16 mm. broad.

Telangiectasis Affecting the Mouth, Pharynx, and Larynx.—SAFRANEK reports (*Jour. of Lar., Rhinol., and Otol.*, August, 1911) this case in a male patient, aged twenty-six years. The right half of the face showed dilated veins, and in the lateral region of the neck the veins showed through the skin as distinct bluish streaks. On the undersurface of the tongue the veins were enlarged to the thickness of a quill. On the dorsum near the tip the dilated vessels had formed two blood-spaces about the size of a bean. On the right side of the soft palate a network of dilated vessels was visible. On the alveolar process of the lower jaw there was a purplish swelling about the size of a bean, composed of tortuous vessels and a similar, but larger tumor lay in the recess of the right pyriform sinus. No further changes were discoverable in the circulatory or other organs.

Lipoma of the Pharynx.—KENYON reports (*Jour. Amer. Med. Assoc.*, June 17, 1911) a large lipoma of the laryngopharynx removed extraorally under cocaine from a woman aged twenty-seven years. It measured $3\frac{1}{4}$ inches in length, $2\frac{1}{4}$ inches in breadth, and 1 inch in thickness. The patient did well, and three years later reported with an increase of weight from 124 to 156 pounds. The pharynx appeared normal except for two or three small obscure patches of thin, shiny, scar tissue.

Malignant Rhinomaxillary Myxoma.—BOTEY reports (*Annales des Mal. de l'Oreille, du Lar., du Nez, et du Pharynx*, 1911 No. 6,) a case of this kind, with fronto-orbital and meningeal propagation recurring after extensive exencenteration, and terminating fatally with symptoms of meningo-encephalitis some two and one-half months after the intervention. The reporter refers to a number of instances of malignant pure myxoma in other regions of the body which recurred almost inevitably after operation. The case referred to is unique in its position and extent. The only case resembling it which he could find was a pedunculated myxoma of the nasal septum, removed by Chiari, with cure of the patient.

Foreign Bodies in the Esophagus.—GUISEZ, in an elaborate article based upon his most recent cases of foreign bodies in the esophagus and tracheobronchial tract, describes (*Annales des Mal. de l'Oreille, du Lar., du Nez, et du Pharynx*, March, 1911), among others, two very ingenious instruments—one for cracking bones which are impacted in the walls of the tubes, and a tube capable of dilatation at its distal extremity, so as to stretch the walls of the esophagus and facilitate the better grasping of the foreign body.

OTOLOGY.

UNDER THE CHARGE OF

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The Treatment of Syphilis by Means of Ehrlich's Arsenobenzol. — FINGER, KREN, and ALEXANDER (*Wien. klin. Woch.*, 1910, No. 47, 48, and 50). The first of these papers is a summary of 170 carefully observed cases subjected to this treatment during a period of five months, in the author's clinic, the observations being further continued after the termination of clinical attendance. The importance of the observations made, in the general aspect of the subject, entitle the communication to careful reading, but for the purposes of a special review it may be excerpted with advantage. A patient, aged twenty-two years, with tertiary syphilis, exhibited, on the first day after the injection, nystagmus, dizziness, and typical vertigo of direction, the auditory apparatus remaining intact. These isolated implications of the vestibular nerve disappeared in a few days. The second case was that of a patient, aged twenty-five years, with an acquired syphilis of six weeks' duration, who, nine weeks after the injection, became the subject of a binaural labyrinthine impairment of hearing which had continued unchanged at the time of the last observation, three weeks after its onset. The Wassermann reaction was negative. The third case was that of a patient with syphilis of three months' standing, who became the subject of labyrinthine impairment of hearing three months after the injection, a condition which had remained unchanged during a period of three weeks' careful observation; in this case, also, the Wassermann was negative. In the first of these cases it was the opinion of Ehrlich that the evidences were those of the Herxheimer reaction, the vestibular nerve being the seat of a latent syphilitic affection, which, exacerbated under the influence of the injection, resulted in swelling and corresponding pressure upon the vestibular nerve. To the two latter cases, however, this explanation is not applicable, in both of them the Wassermann was negative, there had been no secondary manifestations, nor were these justly expected, and the aural symptoms would, inferentially, be referable to the arsenobenzol as their cause. The observations of Kren, reported in the following number of the same publication, covered 140 cases subjected to this form of treatment. The existent aural complications in the observed cases were of a simple character, catarrhal conditions of the tympanopharyngeal tube, middle-ear disturbances, and occlusion of the external canal. One patient, aged thirty-four years, exhibited, two months after an injection of 0.5 arsenobenzol, a labyrinthine deafness; in this case, observation in the clinic of Urbantschitsch left the question still open as to the responsibility of the constitutional disease or of the medication for the aural condition. In 60 cases treated with arsenobenzol and referred to the Urbantschitsch clinic by Riehl, Finger, and Ehr-

mann, 5 cases of monaural implication of the vestibular nerve were observed, the symptoms including dizziness, vertigo, and vomiting, a rotary nystagmus toward the sound side, with absence of caloric or rotation nystagmus; the evidences of vestibular implication began three hours, five hours, and three days after the injection. In 9 cases of aural implication in recent syphilis observed by Alexander, the disturbance of hearing occurred, in 1 case in the thirteenth week, and in the others not until the fourth month; in no instance was the implication so serious as in the cases reported by Finger, and the author is of the opinion, supported by the literature of the subject, that acute luetic neuritis is rare in the early stages of the disease. Of 270 cases observed by Riehl, there was but one in which the administration of arsenobenzol was followed by evidence of implication of the auditory nerve and these symptoms were transitory.

Otosclerosis.—Emil Froeschels (*Zentralbl. f. Ohrenheilkunde*, Band ix, Heft 6). In a review of the contributions to the study of this subject, published within the last two years, since the communication of Heimann (*Monatsschr. f. Ohrenheilkunde*, 1909), in which the characteristic symptoms of this disorder were defined and grouped, Froeschels urges the importance of continued observation and investigation into a subject which is commanding universal interest among otologists. The otosclerosis usually begins during adolescence, and is more common in women than in men, and progresses with increasing impairment of hearing accompanied by annoying subjective tinnitus, and occurs, in the great majority of cases, in both ears but not simultaneously. In the typical form of the disease the drumhead exhibits no indication of catarrhal condition of the tympanopharyngeal tube and tympanum, nor evidence of adhesive process in the middle ear; not infrequently there is a roseate glow in the lower portion of the drumhead referable to injection of bloodvessels on the promontory. In the early stage of the disease the tuning-fork tests indicate plainly the obstruction to sound transmission in the middle-ear sound transmitting apparatus; in the later stage the duration of hearing of the tuning fork by bone conduction is shortened and the hearing for high tones decreased, symptoms indicative of the secondary labyrinth implication; in this stage, also, dizziness is a not infrequent symptom, and occasionally vertigo, severe and of sudden onset. The principal localized abnormality is the bony ankylosis of the stapes and, in the majority of cases, osseous newgrowth on the promontory, and, according to some observers, some other portions of the petrous process. Habermann regards the tympanic mucosa as the starting point of the proliferous process, but Politzer, Siebemann, and many others hold that in the typical otosclerosis the tympanic mucosa is uniformly normal. Under favorable hygienic conditions the otosclerosis often remains stationary for considerable periods, growing rapidly worse, however, under the influence of excessive demands upon the nervous strength, as, for instance, during gestation. The disease is one but little amenable to treatment except in so far as general hygiene and moderate mobilization and moderate stimulation of the intratympanic circulation are concerned. The paracusis willisii, which is not an infrequent accompaniment of this disorder, as of other disturbances in which stapes

ankylosis is an important factor, is explained by Urbantschitsch on the basis of an increased excitation of the auditory nerve, and by Politzer under the more tenable hypothesis of the increase in mobility of the stapes, and other portions of the sound-transmitting apparatus under the influence of the larger sound waves. The etiology of the disease is as yet undetermined. Among French authorities the distinction between the catarrhal processes in the middle ear and the changes characteristic of the disease in question is not clearly marked. Politzer, Siebemann, and some others regard it as a disease entirely independent, in its origin, of the tympanic mucosa, but originating in the labyrinth capsule itself with later implication of the tympanic contents. That heredity is an important factor has been noted by many observers, and especially by Hammerschlagg (*Monatsschr. f. Orhenheilkunde*, 1910, p. 709), who gives the report of families in which congenital deafness and otosclerosis were repeatedly exhibited. The discovery of the Wassermann reaction led to a series of investigations as to the possible relationship between otosclerosis and syphilis, but the sufficiently extensive investigation of Busch, Zange, Arzt, and Oscar Beck in regard to this matter have definitely pronounced against any such causative relationship.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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The Bactericidal Effect of Blood upon Pneumococci.—DOLD (*Arb. a. d. Kais. Gesundh.*, April, 1911) presents his observations on the effect of serum and blood on the pneumococcus. The blood serum of the laboratory animal is known to have no bactericidal effect on pneumococcus, but it had recently been found that human blood was actively bactericidal *in vitro*. Dold finds bactericidal substances varying in amount at different times, and highest in febrile patients. The whole blood apparently is superior by far to the serum in bactericidal powers, and these qualities are not destroyed by heat. The blood of laboratory animals fails to show these positive results, which fact is probably merely an indication of the susceptibility of different species to the pneumococcus. The bactericidal substance is probably existant as a lucein in the leukocytes, and is not secreted by them during their life.

The Permanence of Atypical Characters of Bacillus Coli.—CECIL REVIS (*Centralbl. f. Bakteriologie, etc.*, Band xxxi, No. 14) cites a strange observation with regard to changes undergone by Bacillus coli under partial inhibition by malachite green. With weak solutions a number of forms of Bacillus coli were almost entirely inhibited, but one grew

very luxuriantly, and, after a number of subcultivations, it lost the power to produce gas, while it preserved its characteristics otherwise. This loss of power of gas production has existed to the present after a sufficient number of cultivations have been made, and there is no indication of any loss of vitality in other ways. Characters so acquired are generally relinquished by bacteria in a comparatively small number of generations, but this strain of Bacillus coli seems peculiarly tenacious of its acquirement.

Bacteria and the Intestinal Wall.—An interesting series of experiments has been carried out by M. B. RAVENEL and B. W. HAMMER (*Journal of Medical Research*, June, 1911), with a view to determining whether or not Bacillus prodigiosus could be passed through the intestinal wall and appear in the blood after injection into the rectum. In a series of a dozen rabbits, carefully tended to prevent them from nullifying the results, the findings were remarkably uniform, and in no case were Ravenel and Hammer able to find bacteria in the blood at periods varying from one and one-half hours to five and one-third hours. They did not find either that the organisms were carried far by antiperistalsis, for the bacteria injected into the rectum did not ordinarily reach the bowel above the ileocecal valve. In some cases five hours were sufficient to allow the disappearance of the organism from the rectum; and, however much one may feel convinced to the contrary, the observations of Ravenel and Hammer indicate that there is evidently no passage of large numbers of bacteria into the circulating blood.

Do Infected Cattle Necessarily Eliminate Tubercle Bacilli?—In the *Journal of Medical Research* (June, 1911), VARANUS A. MOORE reports four years' work upon the elimination of bacteria in cattle known to be tuberculous, as well as in those which have merely given a tuberculin reaction. His observations show support of the old view, that tubercle bacilli are not ordinarily present in the milk of animals which show no symptoms, even though they react; he finds further that tuberculous disease of the udder is very certain to show itself by the presence of bacteria in the milk, and further, that the milk is accidentally infected in those cases in which cows have open lesions almost without regard to whether these lesions are in the respiratory, the reproductive, or the digestive tract. Moore experienced some difficulty by reason of frequently finding acid-fast bacteria, which proved non-productive of tuberculosis in the guinea-pig.

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